THE REFINER AND NATURAL GASOLINE MANUFACTURER

In This Issue

Bright Prospects for 1925—A. V. Bourque tells why.

What California Plant Men are Doing with the Absorption Process.

Concrete is essential product around plants that should be given close attention in selection and application.

Burkburnett Gas Supply is diminishing.

Magnolia had scheme for handling acetylene through pipe line in building line to Beaumont plant.

Vol. 4 No. 1 January, 1925 $1.00 Per Year

Natural Gasoline
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GENERAL OFFICES - CHESTNUT & SMITH BLDG. - TULSA, OKLA.

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ROOTS Rotary Pumps are particularly adapted to pumping gasoline because they require no internal lubrication. The only wearing parts are the bearings and their average life is from five to ten years and frequently much longer.

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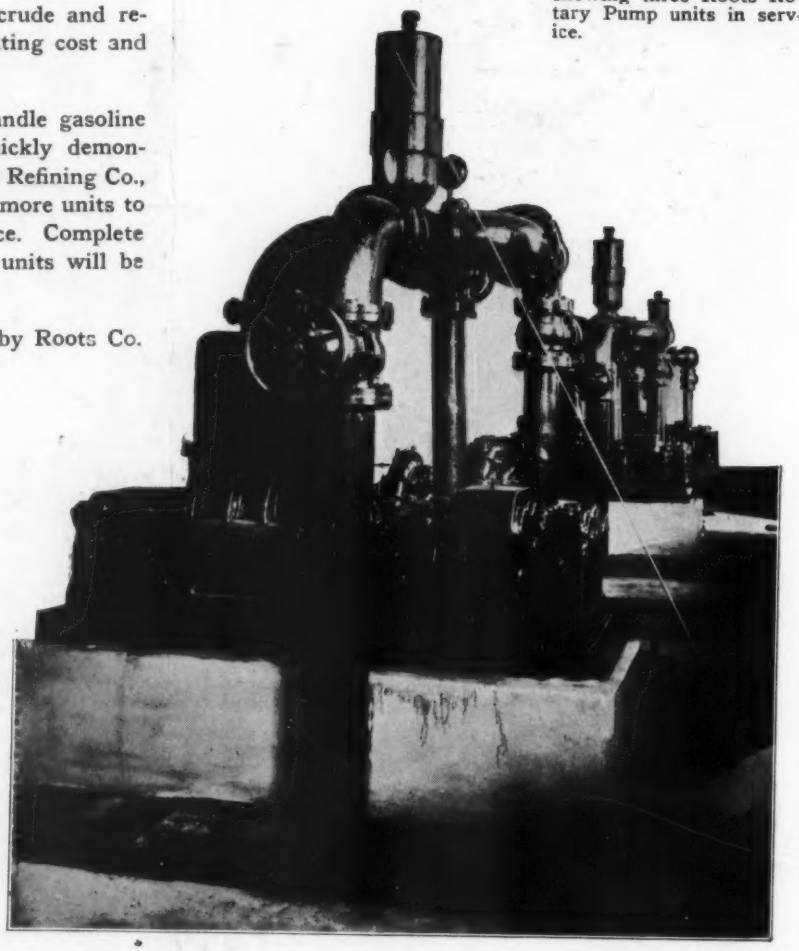
Installations at the plant of the Marland Refining Co., Texas City, Texas, showing three Roots Rotary Pump units in service.



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108—Roots Rotary Gas Pumps.

111—Roots Positive Displacement Gas Meters.

118—Engineering Tables.

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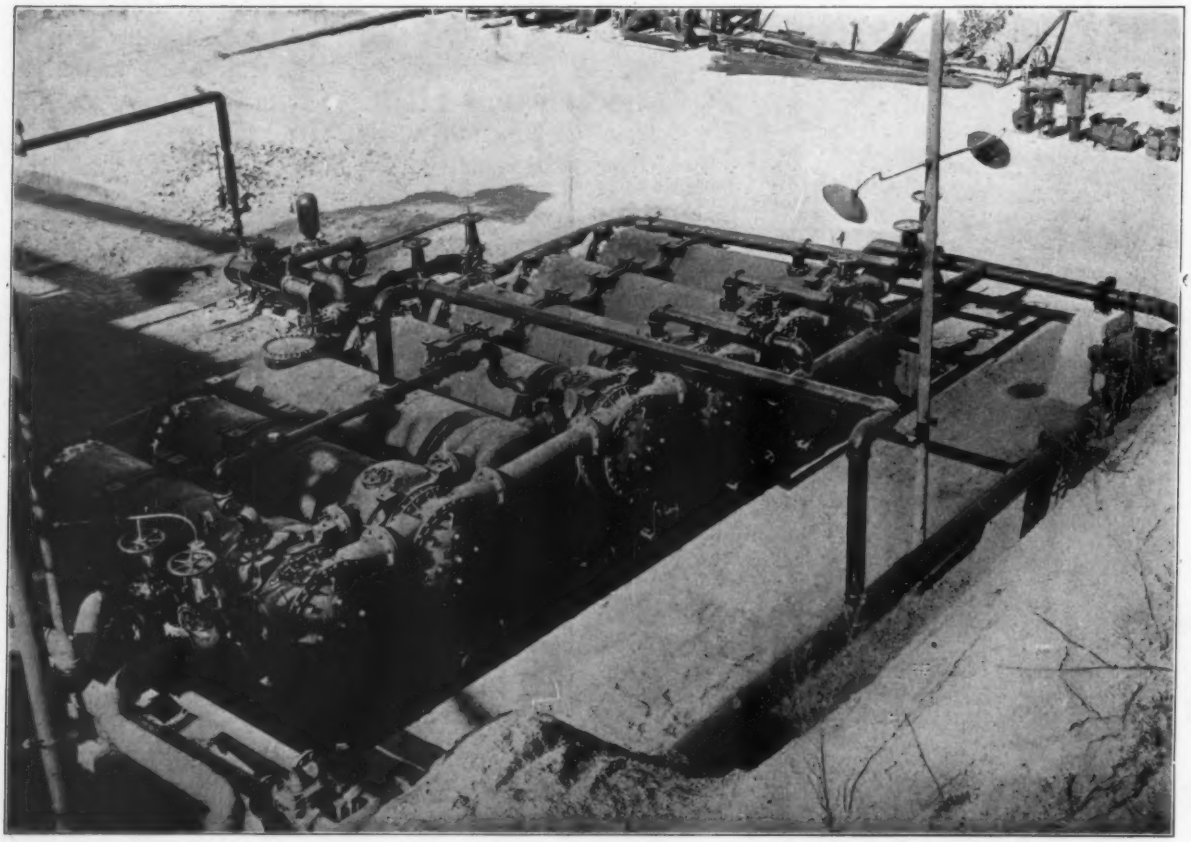
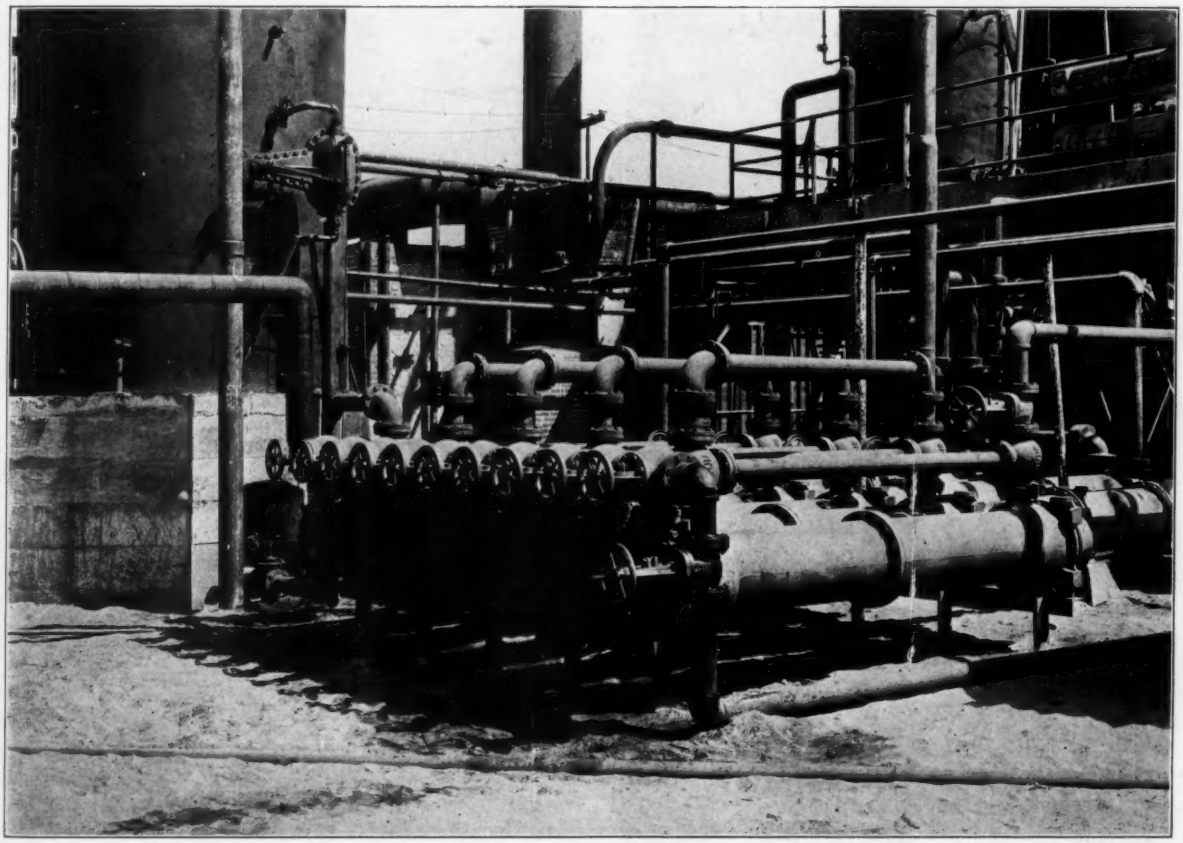


Six Large Braun Residuum to Crude Heat Exchangers in Oil Refinery.

Heat Exchangers



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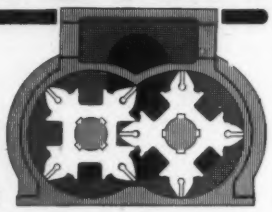

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DESIGN, coupled with use of the best materials, tells why the NORTHERN Pump stands strenuous oil service where all other pumps have failed.

The NORTHERN Rotary Pump has no loaded sliding surfaces inside the casing. All bearings are external to the stuffing boxes; each bearing is provided with a grease cup. Rotors are driven by hardened steel pilot gears outside the casing. Both water gears are driven gears.

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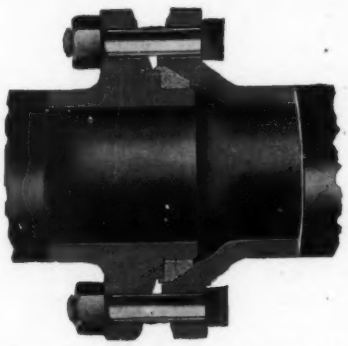

Illustration of section through assembled joint of Simplex Prepared Joint Five-Foot pipe, showing asbestos endless ring gasket in place. This gasket is adapted to use for oil, vapor and acid lines. A rubber gasket is compounded to suit the particular service it is to render—steam, natural gas, artificial gas, water, oil, etc.

Its chief advantage lies in its immunity from corrosion as compared with other ferrous pipe. Its desirability is further increased by the special joint, with only two bolts, and with a thick, endless ring gasket. It it rapidly and easily laid by inexperienced men.

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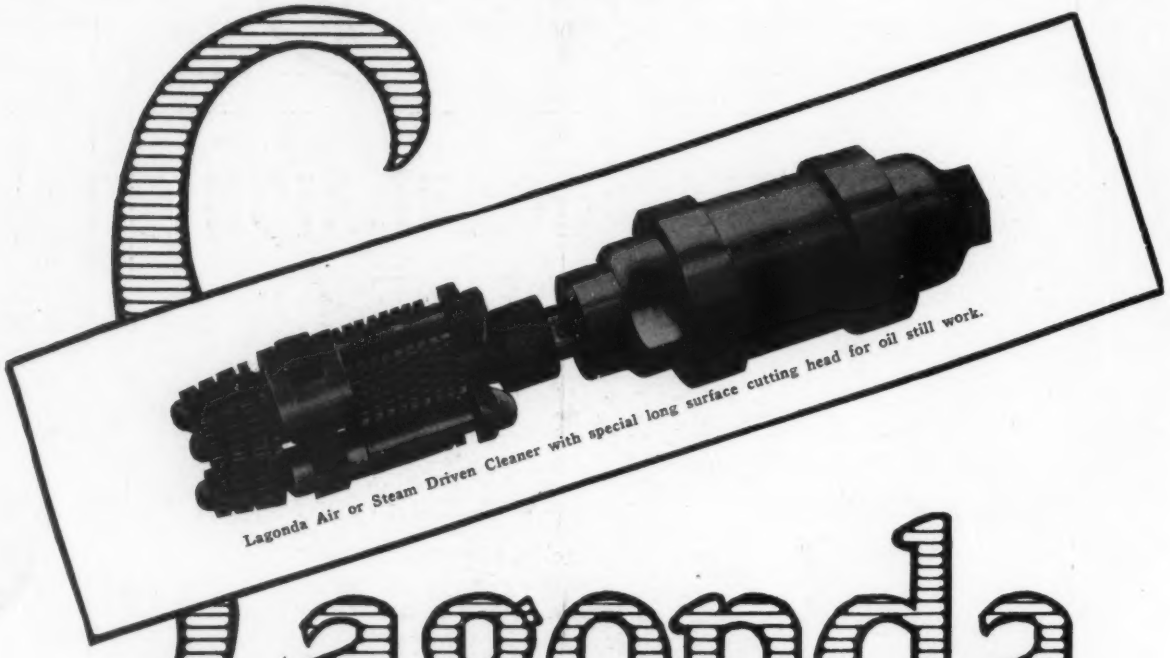

Lagonda Air or Steam Driven Cleaner with special long surface cutting head for oil still work.

Lagonda TUBE CLEANERS

for the oil refinery

For more than twenty years Lagonda Cleaners have been cleaning scale and other deposits from boilers and other tubular apparatus. As soon as the pressure oil still was developed the manufacturers of the processes turned to Lagonda Cleaners for the removing of the hard carbon deposit which formed in these tubes. Lagonda Cleaners have responded to the needs of this special cleaning service and are in use in the great majority of oil refineries.

Some special types of cutting heads have been developed for this work and we can furnish cleaning equipment exactly suited to the particular kind of deposit which forms in any oil still tube.

Quick and thorough cleaning is characteristic of Lagonda Cleaners.

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Lagonda Tube Cutters, Condenser Cleaners, Cap and Header Reseaters, Cleaner Feeding Device

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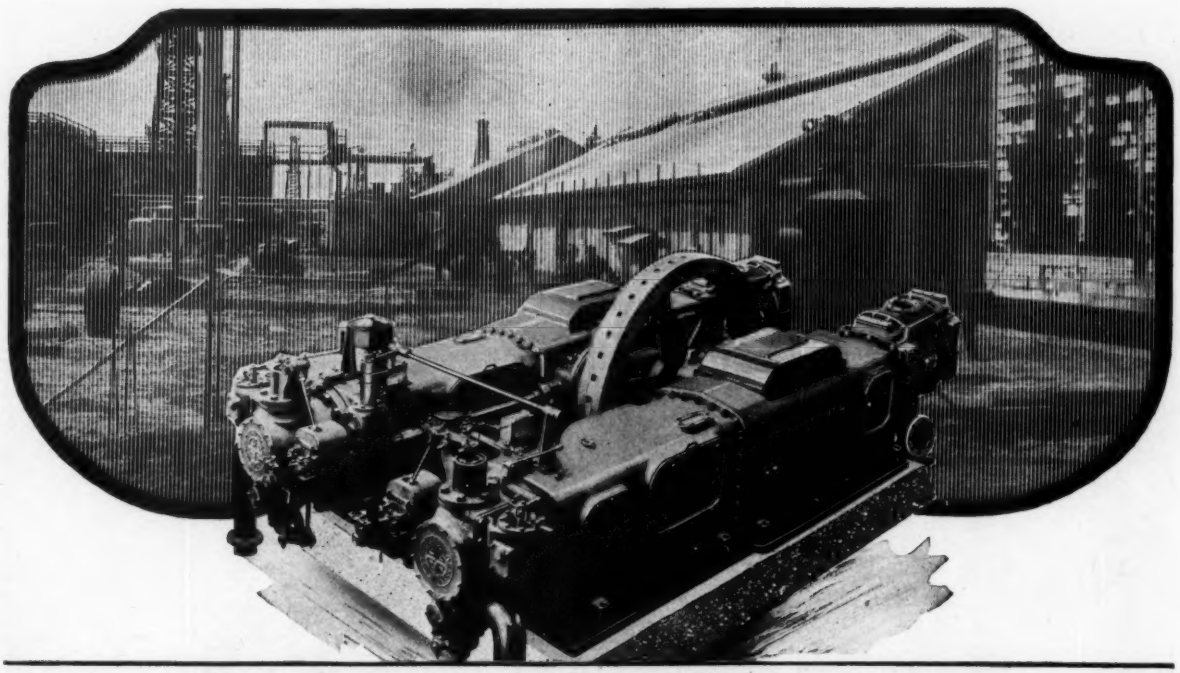

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Bessemer has developed and perfected oil field power equipment of every type to serve the longest, the most economically and with the lowest upkeep cost. The complete Bessemer line includes two-cycle and four-cycle engines, full Diesel, semi Diesel and gas burning engines, direct and belt driven compressors, pumps and roller pumping powers—and the horsepower range is from 15 H. P. to 1000 H. P.

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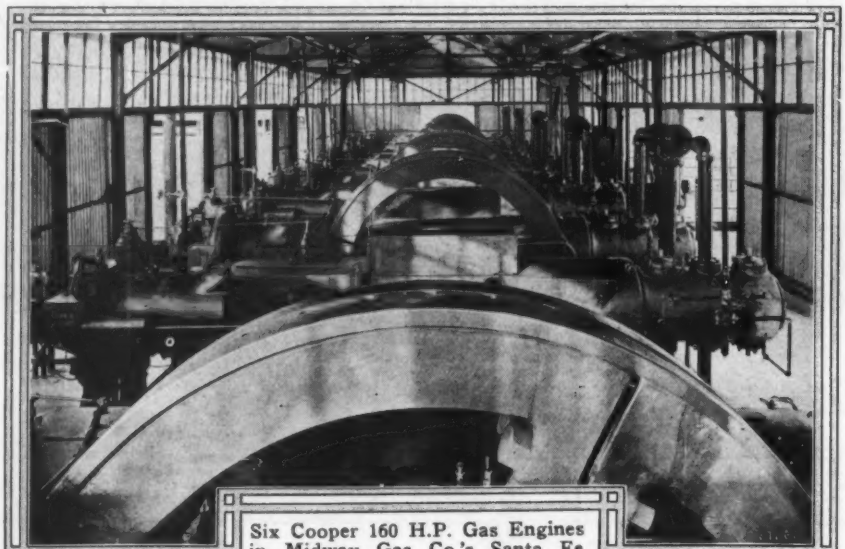

Six Cooper 160 H.P. Gas Engines in Midway Gas Co.'s Santa Fe Springs, Cal., Station

Even the Home Folk Use Cooper Engines

It very often happens that a manufactured product is without honor in its home town. For example, if Cooper engines were not as good as our advertising would have you believe many of you people in West Virginia, Texas or California might be a long time in learning the truth. But if you lived in Mt. Vernon and associated in both a business and social way with the men who, with their own hands, build Cooper engines you would very soon know the whole truth. Hence, it is significant that the Upham Gas Company, a Mt. Vernon company, with no connection whatever with the Cooper Company or any of its personnel, have just purchased their third Cooper 80 B.H.P. gas engine driven compressor. The first two were installed over a year ago.

Cooper engines are built and serviced in a manner which will retain the confidence of those who daily pass our doorstep or those who live two thousand miles away.

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Gasoline Industry in Line for Big Year

Experiences of 1924-1923 form basis for new year "prediction". Seasonal demand may go

By A. V. Bourque
Secretary, Association of Natural Gasoline Manufacturers

THE first day of each new year was formerly given over to the making of resolutions. It should now be called the day of predictions. Predicting this, predicting that for the current year and the oil business is no exception. Reviewing the events of the old year and prophesying for the new has come to be a habit and rather than be accused of being old fashioned I am now about to enter the ranks of the predictors.

"Now is the winter of our discontent made glorious summer by the cracking processes."—A. B. Sorption.

In all the cross word puzzles of petroleum of 1924 there were no words meaning "adequate returns". There were "over production", "low prices", and "excess stocks" but the word of seven letters "success" was apparently in no one's vocabulary. There was not even a synonym for it.

It was a year which apparently began with bright prospects but it failed to live up to its early promise. It was like "gold" jewelry at Christmas which turned green in the spring. It was like prospectuses of summer resorts; like getting 25 miles to a gallon. It was like money in the bank just before Christmas, it simply was not there.

Between the Devil and—

Bounded on the north by over production, on the east by public distrust, on the south by excess stocks and on the west by political perniciousness the oil industry had little opportunity to prosper in 1924. Two of these conditions can possibly be corrected within the industry itself, i. e., over production and surplus stocks and that should go a long way toward prosperity in 1925. On the other hand the remaining two handicaps mentioned may make a year fraught with grave possibilities for the industry, which, under different conditions had every right to expect one of the best years of its existence.

Although 1924 was a bad year for the entire oil industry, natural gasoline, while not having anything to brag about did not fare as badly as it did the previous year.

In respect to the price received, the year was not dissimilar to 1923. It is true the product did not at any time in the past year obtain the top figure of 1923 (14 cents for Grade A) but, on the other hand neither did our product bring such little money as 6 cents, the price at which the year closed. Showing a good increase in January and February, the market slipped from its high point of 11¾ cents in February to as low as seven cents in the early part of June. The end of June saw an advance to around 7¾ cents and from then on there was a varying increase until the middle of September when 9 cents was touched. The first week in October showed a break to 8 cents and later the price ranged from 8¾ cents average in November to 9 cents in December, the year closing with the latter figure. This was a gain of three cents over the close of the previous year. As this is written, the second week in January, the market is holding at 9 cents, comparable to the figure which obtained at that time a year ago.

It was the steady demand rather than a high price which lent the encouraging aspect to the natural gasoline industry. While the price was hovering around 7½ cents in July, orders were mounting up and virtually every gallon was moved out as it was made. This condition continued right up to the end of the year, swinging to eight cents in price in October and then on up to nine cents without a break.

The early part of November, 1923, saw millions of gallons of natural gasoline in storage. The corresponding period of time in 1924 witnessed a splendid movement, practically every tank being empty. This condition has prevailed up to now and it is the most encouraging feature of several disastrous years.

Seasonal Demand to Go

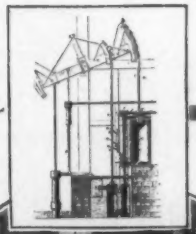
Such a condition indicates an elimination of the so-called "seasonal demand." It has been apparent always that natural gasoline with its low boiling point meant quick motor starting in cold weather but with large stocks of straight run on hand the refiner bought as sparingly of natural gasoline as possible. With the cracking processes turning out a product which needs stimulation, the demand for natural gasoline has grown to a point, where, with the winter half over, practically every gallon of the product is being disposed of, a record unprecedented in the history of the industry. All of which points to a big year for this product in 1925.

A big winter movement should mean a tremendous demand in the hot months of the year. And one prediction I will venture to make is that there will be a scarcity of the product before the big buying months of August and September. It would not surprise me if a refiner who has not already arranged for his next summer's requirements will be able to supply his needs.

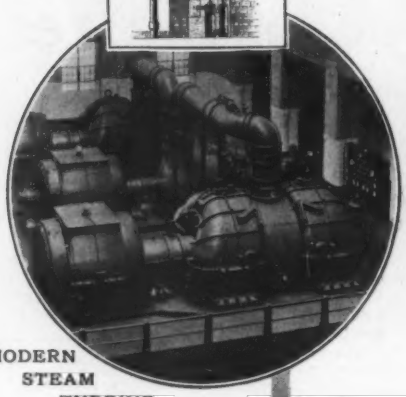
This statement is based on the strength of the large movement at the close of last year, the steady demand through the cold weather just experienced and the number of large contracts already closed, which bid fair to take all of the available supply with no possibility that there will be an increased production to take care of the expected demand.

Heretofore the manufacturer expected to equalize his ruinous prices (to him) in winter with equally ruinous prices to the refiner in summer. But with the refiner buying all the product in winter and paying a fair price when the market price of other refined products are taken into consideration, he will find the natural gasoline manufacturer willing to meet him half-way when the summer months bring their increased needs for his product.

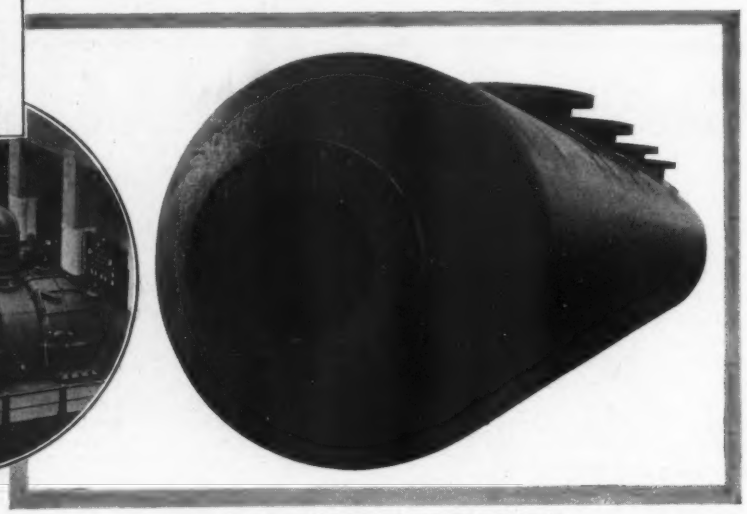
Pressure of Economic Forces



WATT'S ORIGINAL STEAM ENGINE 1774



MODERN STEAM TURBINE



THE MOST MODERN DEVELOPMENT OF STEEL PLATE CONSTRUCTION— A SEAMLESS, BOTTLE-TIGHT HAMMER-WELDED STILL

Pressure of Economic forces demanded the development of the modern steam turbine from the crude machine of James Watt.

The same forces demanded the development of the Blaw Knox Hammer Welding Process for the manufacture of tanks, oil cracking stills, autoclaves, etc.

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Absorption Process Maintaining High Rank

Method of gasoline extraction not likely to be replaced—Its adaptation to California conditions

By A. L. Stallkamp,
*Field Engineer**

FOR the preparation of specification gasoline, to meet the various requirements of the trade and the government regulations, considerable quantity of low boiling point hydrocarbons must be blended with the average refinery stock to produce a desired low initial boiling point. These fractions do not exist in the average crude oils and therefore cannot be obtained in the ordinary distillation without cracking, which would destroy the heavy portions for lubricating stock.

Complete cracking of crude oil is, however, carried on for the production of gasoline and enough fractions produced to make specification gasoline but not in quantities to supply the blending requirements of the distilled refinery stock.

This necessary portion of commercial gasoline is drawn from natural gas where it exists in a vapor state as a true mixture with other hydro-carbon gases. In this state, they conform to the characteristics of gas and can be recovered by one of several methods—absorption, refrigeration and condensation under pressure. Each of these systems has its general field application but can be modified to suit existing conditions.

*Southwestern Engineering Corporation.

Of these the oil system of absorption has proven to be of the most practical use and has to a large extent displaced other methods in the California gas fields.

Because of its inherent flexibility it has been adapted to all gases and accordingly has been applied as the method for general use.

This almost universal application has given impetus to constant development and refinement so that today high extraction efficiencies and low production costs have been obtained. Modifications have permitted its use in practically all cases for rich or lean gas and simplification has brought it to the stage of one-man operation in fairly large capacity plants. The procedure of the process has remained the same, the improvements having been made in apparatus and in the extent of treatment of the oil in distillation.

Essentially the oil absorption system consists in absorbing the gasoline fractions from the gas stream by means of a solvent oil which carries the gasoline in solution to an evaporator or still where it is driven off by heat and subsequently condensed to a liquid by cold water. The hot oil after being stripped of its gasoline content is cooled in exchangers and water coolers to be used over again in closed cycle in the absorption towers. The gas is treated once in the towers by the oil which circulates continuously through the plant.

The oil used in the system is usually a distilled mineral oil obtained as one of the temperature cuts in the refining of crude oil. A distilled over product is essential for smooth operation as only under such conditions can an oil of uniform low viscosity and proper boiling point be obtained. A distilled over product also keeps the emulsification properties at a minimum so that excessive steaming will not cause the oil to foam and carry over with the gasoline vapors.

A typical distillation range and specification of a good oil for absorption plan use is:

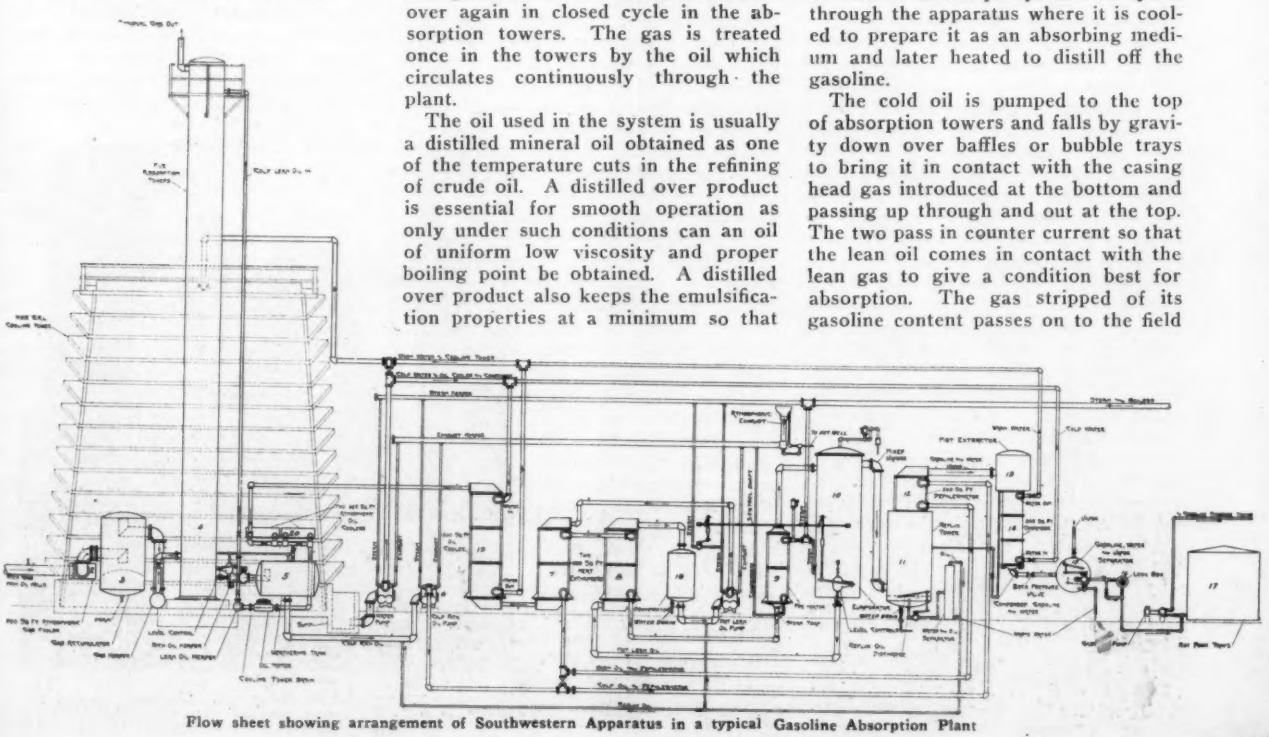
Gravity, 31 Be at 60 degrees F. Color, amber. Viscosity, not more than 45 at 100 degrees F. Saybolt. Initial boiling point, 525 degrees. Maximum boiling point, 705 degrees.

Initial 525 degrees; 10%—549 degrees; 20%—562 degrees; 30%—572 degrees; 40%—582 degrees; 50%—592 degrees; 60%—605 degrees; 70%—621 degrees; 80%—639 degrees; 90%—672 degrees; Max.—705 degrees.

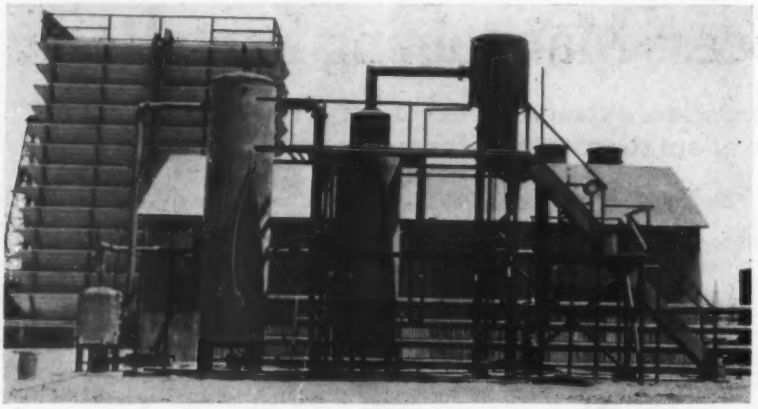
In accordance with Henry's Law, the absorption capacity of any given oil varies with the pressure under which the absorption takes place, absorption being higher for greater pressures. It is of advantage to have the gas pass through the plant at as high a pressure as will not require excessive expense for extra strong equipment. Less oil carrying saturation can be used to obtain the same extraction which reflects on the amount of equipment necessary to treat the oil. Also higher pressures require fewer towers and smaller gas piping, thus keeping the cost of installation low.

The absorption oil contained in the system is circulated by means of steam or electric-driven pumps in two cycles through the apparatus where it is cooled to prepare it as an absorbing medium and later heated to distill off the gasoline.

The cold oil is pumped to the top of absorption towers and falls by gravity down over baffles or bubble trays to bring it in contact with the casing head gas introduced at the bottom and passing up through and out at the top. The two pass in counter current so that the lean oil comes in contact with the lean gas to give a condition best for absorption. The gas stripped of its gasoline content passes on to the field



Flow sheet showing arrangement of Southwestern Apparatus in a typical Gasoline Absorption Plant



3000 gallon gasoline absorption plant showing pre-heater, steam still, dephlegmator, and condenser surmounted by a mist extractor

or to be used under the boilers, while the oil now carrying the gasoline is passed on to the evaporator for distillation.

As an economy of heat and equipment, the cold rich oil coming from the towers is passed through an exchanger with the hot lean oil from the evaporator passing in the opposite direction separated by the thin walls of tubing having a high heat transfer. The cold oil becomes heated and the hot oil cooled in the exchange to within about 40 degrees of the oil it is in contact with. This exchange not being complete, the additional heating and cooling is done with high pressure steam and cold water. The steam heater resembling the exchanger in construction and functioning in the same principle except that the heating medium is steam at boiler pressure held against a trap, raises the temperature of the oil to approximately 300 degrees.

This oil and gasoline now at a temperature where the gasoline is practically converted to a vapor again is discharged into the top of a closed evaporator or still held under a slight pressure and distributed over a series of pans or baffles to produce large evaporating surfaces. Considerable of the gasoline is converted to a vapor as soon as it strikes this zone of lower pressure and passes on to the vapor draw-off line. The heavier and higher boiling point gasoline fractions still contained in the oil are displaced as the oil passes down over the baffles in thin films by means of steam introduced at the bottom and rising up counter current. The steam vapors by contributing a partial pressure over the evaporating surface, lower the boiling points of the dissolved gasoline and by a sweeping action, carry the gasoline vapors out of the oil and to the vapor draw-off line. The steam introduced below the level of oil in the still furnishes heat and carrying atmosphere for a last distillation phase before the oil leaves the evaporator.

The efficiency of this unit is very vital for maximum efficiency of the plant as oil for high absorption capacity must be entirely free from gasoline. A few per cent. of gasoline saturation left in the oil will require greater volumes of oil to be circulated for given recoveries and not allow for absolute extraction from the gas. A definite relation between vapor pressures of the gasoline in the gas and in the oil exists, which must be in favor of the oil in order to have absorption. Beyond this, no absorption can take place.

The oil, now stripped of its gasoline but still hot from the evaporator, is cooled by passing through the exchangers where it gives up its heat to the rich cold oil and finally by passage through cooling equipment, where cold water is caused to circulate, also in counter current principle.

The oil is then in condition for absorption and is pumped over the absorption towers in a new cycle.

The gasoline and steam vapors from the evaporator at approximately 300 degrees are a mixture of gasoline fractions and oil, some of which must be filtered out so that the final product of gasoline will meet the required specifications of maximum boiling point and color. In cleaning the absorption oil to its very low gasoline content, some of the oil is carried over, which is considered along with the gasoline would give an amber color and excessive end boiling point.

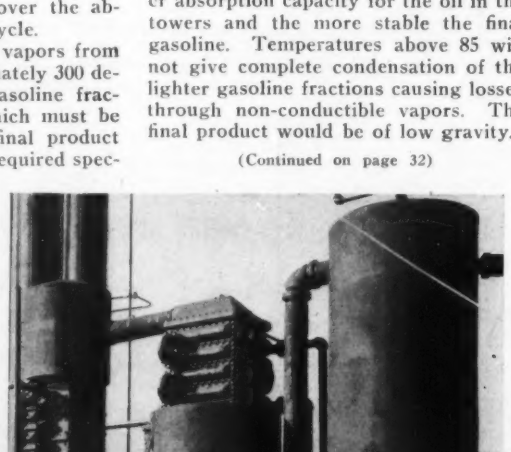
A dephlegmator or control section circulating cold oil or water as the cooling medium is placed in the stream of vapors coming from the evaporator and condenses all of the higher boiling fractions and some of the gasoline. These fall as a liquid over a series of pans or baffles swept by other hot vapors from the still. The light fractions are re-evaporated and go on with the gas stream while the heavy ends and oil collect in the bottom of a tower and are returned to the rich oil of the circulating system. Steam condensed in this dephlegmator is separated from the oil and discharged as waste or through an oil strainer to the hot well for boiler feed.

The clarified gasoline vapors are allowed to pass into the main condenser circulating cold water as the cooling medium, and are condensed to a liquid. Whatever steam is not condensed in the control section is condensed along with the gasoline and separated by gravity in a dehydrating tank. The water is discharged to waste while the gasoline is allowed to flow through a look box—for observation of the stream—to gasoline run down tanks and storage.

Some of the gases absorbed by the oil in the towers are of too low boiling point and not condensable at the ordinary water temperature. These vapors are cooled along with the gasoline and later separated in the dehydrator. It is not practical to cool these vapors to the point of condensation as they cannot be stored except under pressure as a liquid and if added to the gasoline would be lost by evaporation in storage.

A good supply of cooling water under pump pressure is essential for smooth and efficient operation. It should be as cool as is practical to obtain to give high transfer of heat in all cooling equipment and to produce low final temperatures of gasoline and oil. The lower the temperatures, the greater absorption capacity for the oil in the towers and the more stable the final gasoline. Temperatures above 85 will not give complete condensation of the lighter gasoline fractions causing losses through non-conductible vapors. The final product would be of low gravity.

(Continued on page 32)



Operating arrangement of steam still, dephlegmator and condenser in a 15,000 gallon gasoline absorption plant built by the Southwestern Engineering Corporation of Los Angeles

Concrete Is Plant Item Worthy of Study

Proper selection of material in construction work will eliminate many operating troubles

By Harry Pennington
Mechanical Engineer

THERE are various requirements or concrete, and the quality may be commercially made to suit each requirement. Concrete to be reinforced with steel must be of better grade than plain or mass concrete, because the unit stress in compression may be fixed at a higher figure in reinforced concrete than in plain, and reinforced concrete is also placed in tension in certain portions of structures.

Cement is the principal item of materials cost in concrete. The quality of freshly made cement in standard brands varies but little, but there should be a specification for purchase and each shipment should be tested to insure uniformity.

The quality of aggregate for concrete affects not only the strength but the cost of concrete in place for various purposes.

The theoretically perfect concrete is that in which the percentage of sand equals the void of space of the aggregate—stone or gravel—and the percentage of cement sufficient to fill the voids in the sand. This mixture is seldom obtained, though, as shown by tests and it is necessary to add more cement to insure homogeneity.

The void spaces in various aggregates ranges up to 50 per cent in broken stone of uniform size, down to 25 per cent in graduated gravel. Then, when a broken stone aggregate has 50 per cent voids, it is necessary to add 50 per cent of sand to fill the stone voids, then add sufficient cement to fill the voids in the sand. If the sand voids are 30 per cent, we have the proportion, for one yard of concrete, 27 cubic feet of stone, 13½ cubic feet of sand and 4.05 cubic feet of cement, or the mix becomes 1 of cement to 3⅜ of sand to 6¾ of aggregate.

In theory, this mixture would be homogeneous—free of air spaces, but in practice these proportions do not furnish concrete that compares in strength with richer mixtures. Compression tests show that the richer the mixture, up to certain proportions, depending upon the aggregate, the greater strength developed by the concrete.

Consequently, the leanest mix for the aggregate with the maximum void is 1:3:6 in practice, which may be used for mass foundations where great strength is not required.

Taking next, an aggregate of graduated sizes of gravel, with 30 per cent voids; to fill the voids in 27 cubic feet requires 8.1 cubic feet of sand and with 30 per cent sand voids, 2.43 cubic feet of cement, making the proportion 27 of aggregate, 8.1 of sand and 2.43 of cement. It will be noted that this yard of concrete required 1½ cubic feet or sacks of cement less than the previously proportioned yard. Each of the two yards will develop about the same strength, but the latter will cost less because cement is the most expensive ingredient.

But because aggregate varies so much in void percentages, the usual practice is to use more than enough sand to fill the voids in the aggregate and more than enough cement to fill the voids in the sand.

In laying foundations for boilers, engines and other heavy equipment as well as in other construction work around refinery and gasoline plants the use of concrete is becoming more general. As pointed out in the accompanying article by Mr. Pennington, there are various requirements for concrete and the quality may be commercially made to suit each requirement.—Editor.

These figures are simply to emphasize the selection of aggregate, as a means of securing the best concrete for a given purpose at the lowest cost.

Where a definite mix is specified, less materials will be used where the aggregate is composed of well graduated pieces. For instance, a 1½-inch gravel with all pieces below ½ inch screened out, has an increased voidage by the amount of pieces ranging in size from ¼ inch to ½ inch. And it is evident that the space formerly occupied by the ¾ inch to ½ inch pieces must be filled with sand and the sand voids with cement.

But where the graduation is such that equal amounts will pass a ½ inch screen and be retained in ¼ inch; on ¾ inch and ½ inch; and 1 inch and ¾ inch; on 1¼ inch and 1 inch and on 1½ inch and 1¼ inch we have a near perfect graduation between ¼ inch and 1½ inch which makes denser, more homogeneous, stronger concrete.

And going further, to jump from a 20 mesh sand to ¼ inch gravel, increases the voids. The sand itself, to secure minimum voids must be graduated from the finest up to ¼ inch and range into the aggregate in that manner. Where the aggregate is ¼ inch in its smallest sizes, sand should range up to ¼ inch also. If all the sand is fine, there will be no graduation between the sand and the smallest gravel Not more than 25 per cent of sand should pass a 60 mesh screen anyway. Torpedo sand is the trade name for the best grades of sand.

The purpose of cement is to fill the voids in sand and bind them and the aggregate together; the less voids present, the greater the excess cement in a given proportion of concrete mix and the stronger the concrete, due to cement excess.

A high void sand and aggregate requires more cement to secure a definite strength than a low void sand and aggregate as may be seen. Where the sand and aggregate is purchased after careful tests of voids, and the upper limit of voids held down to a certain point, then concrete mix proportioned to such a good quality of hard, dense concrete may be secured without additional expense; more than likely, concrete will cost less using the same proportions when this detail is carefully handled.

The only methods of securing a low void aggregate is to purchase quantities of each size of aggregate, on a tonnage basis, then to use the proportions of each as required for each part of structure or work.

Again, using scientifically graduated gravel as against a high void gravel. It will be found that where the usual amounts of aggregate, sand and cement are delivered on a job for a given concrete yardage, that there will be material left on hand after finishing the job when low void aggregate is used. On one job, handled by the writer, each unit required the same quantity of materials, but a crushed gravel was delivered for six units and a graduated uncrushed gravel for six other units. The graduated aggregate, when mixed to specification, filled all the forms of six units with concrete with 22% of aggregate, sand and cement remaining unused while with the crushed, ungraduated aggregate there was insufficient material on hand to fill the forms with concrete, using the same specified mix and it was necessary to use the material left over from the former six units to complete the latter six units.

In dollars and cents, the difference in cost computes:

Cost of graduated aggregate concrete in place, $12.60.

Cost of non-graduated aggregate concrete in place, $15.74.

Thus, the graduated gravel concrete cost $3.14 per cubic yard less in place than the non-graduated crushed gravel concrete, due wholly to the aggregate.

And we can see that the graduated aggregate was worth $3.14 more per yard of concrete, or $2.51 per yard of aggregate more than poorly graduated aggregate.

From which we can see that the pur-

(Continued on page 31)

Burkburnett Gas Reserve Fast Vanishing

Situation endangers natural gasoline plants and forces lease owners to seek other power

By H. H. King
Staff Representative

Burkburnett, Texas.—Lack of new gas production and the natural decline of wells in the Burkburnett field has brought forth a condition whereby the lease owners must abandon the use of natural gas, or residue for power in pumping their wells and operating vacuum stations, else deprive themselves of an attractive revenue through the sale of this unusually rich gas to natural gasoline manufacturing plants. The production curve on natural gas in the Burkburnett field has been falling at a faster rate in the past two years, with vacuum being pulled on the wells to the limit, and the return of cold weather has diminished the volume of residue from the full score or more plants to a level that is barely sufficient to operate on when the maximum recovery is taken from the natural gas.

This condition has been growing more serious each year, and a number of foresighted lease owners have prepared themselves by switching from gas fuel to electric motors, or engines deriving their power through gasoline or fuel oil carburetors. A great number of individuals and small companies operating leases in the field have hesitated on making this change in their lease equipment, and when cold weather practically eliminates residue gas returns the field men are allowed to divert all the natural gas from the plants and utilize this rich gas for fuel in the pumping engines. The plant owners, who have been operating below their built capacity since the "head" was taken off the Burkburnett field, are placed at a further disadvantage, and will be forced to junk the plants dependent on purchased gas unless the producers discontinue the use of fresh gas in pumping wells.

The loss of revenue from gas sales to natural gasoline plants is keenly felt by Burkburnett producers, but many have elected to make this sacrifice, which is more general during the winter months, rather than to assume the expense of replacing their gas engines on individual wells and central power plants with electric motors or oil burning engines. The days of gas engine use in the field are fast approaching the end, and the gas supply will be exhausted before the wells cease to produce oil in commercial quantities, thereby making it necessary to install motors or oil engines during the final period of the life of the wells. Considerable thought has been given this situation by producers during the past year, and a careful investigation has resulted in many removing their gas engines and selling every available foot of their rich gas production to help defray the cost of making the change in their pumping equipment before the individual well revenue declines to a level that would not justify an added expense in equipment.

Gas production in the Burkburnett field has declined to less than 3000 cubic feet per well daily, and considering that an ordinary 25 h. p. gas engine uses approximately 10,000 cubic feet of gas daily, the life of a gas engine in the field has already passed on the majority of the leases in the field. This gas carries an unusually large gasoline content, ranking among the highest in the country, and many of the natural gasoline plants are shipping from 9 to 10 gallons of gasoline per thousand cubic feet of gas, while the yield from gas in some of the wells runs well above 15 gallons per thousand cubic feet. Such a high gasoline yield materially lessens the volume of residue available after the gas has been run through a plant, and when a reasonable amount of residue is used for fuel in the plant only about 15 to 25 per cent of the original volume remains, thereby making it almost impossible to return enough residue gas for lease operation.

Some of the gasoline manufacturers have old gas contracts calling for the return of a certain percentage of the gas furnished from wells for lease operation, and in such cases the full contents of the gas cannot be extracted, while some of the plant owners have seen fit to purchase dry gas from a local distributing company and deliver to producers in lieu of residue gas from their plant. This practice involves heavy expense in carrying on operations, and often places the gasoline manufacturer on an unprofitable basis.

The gasoline yield of Burkburnett gas has reached its peak in volume, as the prevalence of water in the oil and gas sands creates a vapor that serves to cut the gasoline contents down. The percentage of air handled with the gas drawn from wells by vacuum is also steadily increasing, and some of the plants are operating on vapors that carry as high as 40 per cent air. Handling such a volume of air through the plant has materially added to the operating expense, and employes of Burkburnett plants have accomplished much in perfecting means for overcoming the difficulties that the air problem offers.

Crude oil production in the Burkburnett field amounts to less than five barrels daily per well, and the field has 3350 shallow and deep wells, but gas is not available in all the pumping wells, while a few wells are producing gas that is too lean to use in a natural gasoline plant. Crude production is greatly reduced when cold weather prevails, owing to gas production falling off below the needs of gas engines on pumping wells, and the shutdown time loss is costly to lease owners, as the wells show the effect of standing idle several days with water on the sand pay.

Electric motors have been used to replace gas engines on many of the leases in the Burkburnett field, while a number of operators are finding gasoline and crude oil carbureters more economical. The Wichita Falls Electric Company is in a position to provide ample power for electric motor operations, and the electricity charge for single well operation on the beam is $50, more or less, while the rate is much cheaper when operating a power with electricity.

Since some of the leases in the field have a fairly good gas supply during the summer months, the gasoline carburetor on a gas engine is probably the most popular substitute for gas power, as the engine can be switched from gas to gasoline on short notice. The gasoline cost is not great, since low grades of gasoline can be burned without difficulty and ample power exists. Magnolia Petroleum Company is using gasoline carburetors on a number of its wells and central power plants, and its booster station on the Van Cleave lease is equipped with a 35 h. p. Ingersoll Rand engine that can be switched from gas to gasoline in a few minutes time. This engine burns about one 55-gallon drum of gasoline every 36 hours while carrying a heavy load, and has a Kingston Model "E" carburetor that has been in use for several years without giving trouble. This carburetor permits an air mixture of about 85 per cent, thereby holding down fuel costs. Small pumping engines at wells consume about one gallon of gasoline per hour when a good mixture of air is added.

A crude oil carburetor has also been introduced with success by some of the companies in solving their power troubles, but the crude oil carburetor is more complicated than the gasoline carburetor and used less extensively. The crude oil carburetor affords the most economical power of any available in the field, and the vapors obtained from the crude in supplying fuel for such a carburetor does not lessen the quantity or gravity of the crude used to any noticeable extent.

100 Recent Orders
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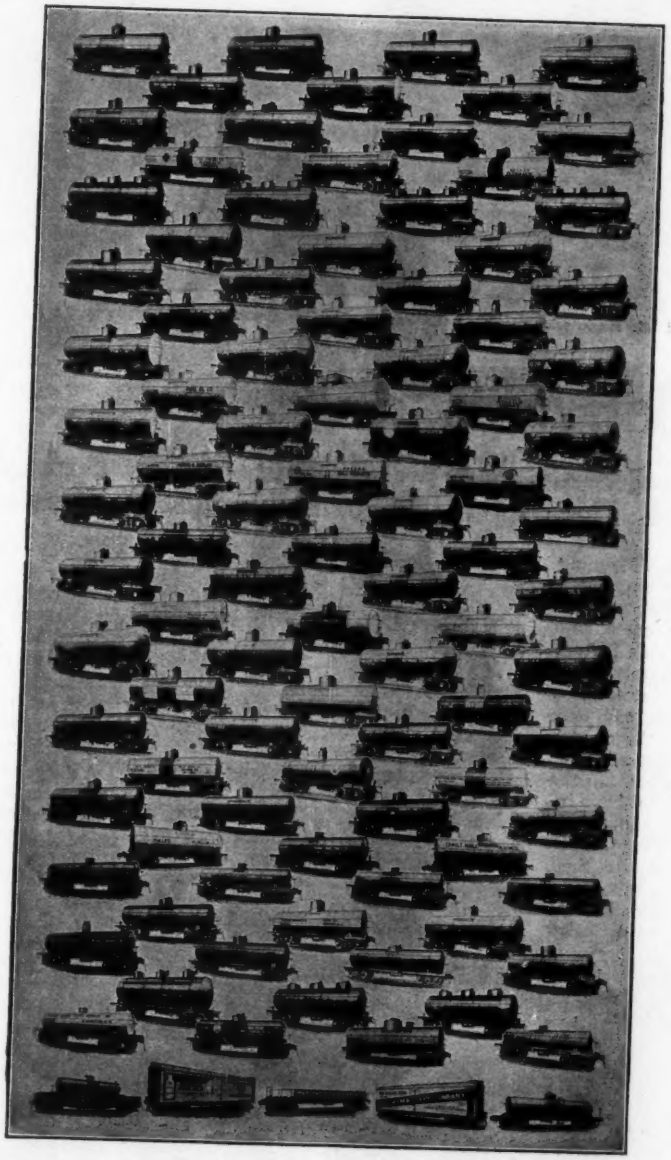

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New York
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At right and left are interior views on the Empire Gasoline Company's new plant in the Burbank field. Lower center is a general view of the plant.

This Plant Has 100% Salvage Value

Empire engineers build gasoline unit at Burbank with idea of smallest possible loss in moving

By W. Lee Sloan
Staff Representative

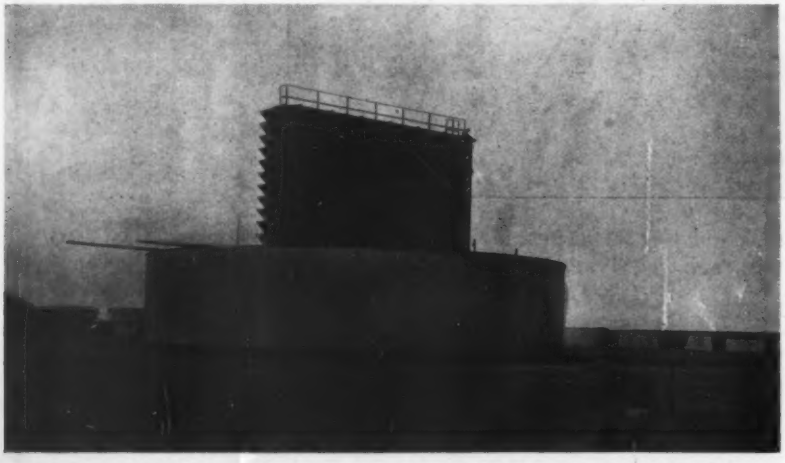
IN building the natural gasoline plant of the Empire Gasoline Company in the Burbank field of Oklahoma, engineers have planned the most simple methods of construction. This feature coupled with an idea of complete salvage value of each unit is noteworthy.

Due to the fact that this company has an adequate market for the residue gas from the plant, the compressor type of extraction has been installed. In the compressor plant, the sectional bays installed to house the nine 160 H. P. compressor units and the three 80 H. P. units can be removed at any time, taking out any unit found unnecessary with the depletion of the raw material. These bays can be removed to other locations at any time with but little cost.

The compressor building is 31 feet by 196 feet, large enough for the engineers and other workmen, yet small enough to insure the greatest efficiency in plant operation.

The exhausts from the engines are run into an open concrete pit, a feature minimizing explosion hazards brought about by explosive elements being thrown through the exhaust. An open space has been left for the workmen in case of repair.

The gasoline storage tanks have been placed in such a manner that the main building is on one side and the office of the company on the other, an insurance feature against fire or theft. By placing the tanks in this position, the man on duty has perpetual surveillance over the stored product. A direct pipe line from the main part of the plant to the tanks reduces the necessity of additional pipe.



The water tower at the Empire Plant has been made from three rings of a 37,000 barrel crude storage tank.

A large water tower which is used as an auxiliary supply in case the pumps fail to function has been erected on a high spot on the ten acre site of the plant. Three rings of a 37,500 barrel crude oil tank are used as a container in this water unit while the tower itself extends 24 feet above the main base. A water supply for the operators houses also comes from this tank. Being a factory fabricated tank and tower, it can be removed at any time by dissembling it piece by piece.

Unlike other plants in the Mid-Continent area, the Empire Company has installed the three stages of compression in the main plant. Pumping from nine inches of vacuum into the first stage where 16 pounds of pressure are used, then to the next stage of 85 pounds to the final stage of 300 pounds of pressure. The three stage compression is used because it makes possible a higher degree of efficiency than a two stage process with a vacuum unit.

Six 5x8 scrubbers are installed in the intake lines, an apparent excessive number for the average gasoline plant but the Empire engineers are of the opinion that with such ample protection against water and other emulsions,

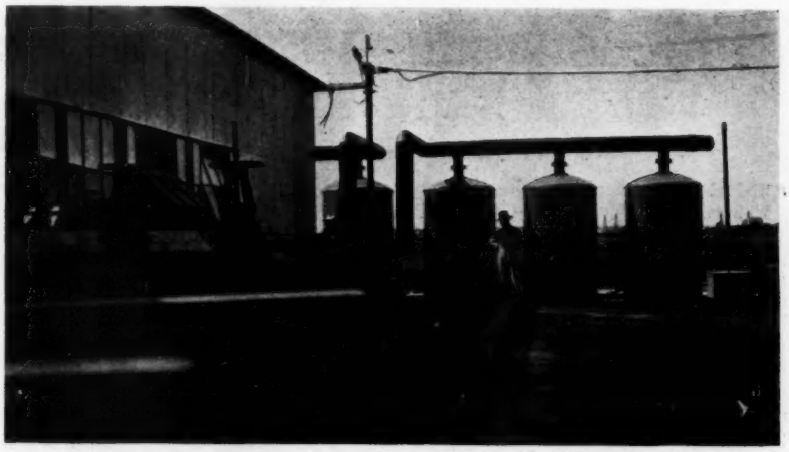
there is little danger if any of it ever finding its way to the compressors. Drips are unnecessary with such an insurance against any foreign matter.

Every water, gas or oil line in the entire plant is equipped with a measuring instrument and the performance of each is recorded at all times and the reports sent to the department office at Bartlesville daily. By using these apparatuses, the company head is able to ascertain any possible trouble which might occur from air, water, gas or from any of the equipment.

Insurance of a full day of work has been further augmented by the installation of a filtering system on each unit. This system can be used in case the oil pumps in the engine are not functioning due to clogging of dirt and other sediment. The oil being pumped through the filter is relieved of all foreign matter and a supply of 11 gallons of oil is always ahead of the pumps. This 11 gallons of additional oil is used in case of emergency and is sufficient to supply any unit for more than four hours. It is noticeable that every working part of the plant has an auxiliary to the main working unit to insure a 24 hour working period for each day.

The tanks used in the storage system are designed so as to be as large as possible and yet fit a flat railroad car and can be moved at any time. They are 10 feet 3 inches in diameter and 40 feet 6 inches in length. The insurance rate on such a battery of tanks is no more than the one-tank system sometimes used. These tanks are both riveted and welded and are installed in battery to save concrete work. They are designed to withstand 30 pounds of pressure which is generally accumulated with the natural gasoline itself. By withstanding this amount of pressure, there is very little chance for the product to evaporate. All pipe lines around and to the tanks are also of the welded type as a further insurance against evaporation.

Battery of storage tanks at the Empire Plant. Notice the size of the tanks and the absence of concrete bases.



Showing four of the six large scrubbers used in the Empire plant.

The closed type of cooler, a product of the C. F. Braun Company of California has been installed and are in units of three each, any one of these units being movable at any time when deemed necessary. Each stage of the process is taken care of by each of these units of different sizes.

The auxiliary installation is duplicated in all details, one unit serving as a standby for the other. The drive on the auxiliary engines is from a stub shaft, extending from one of the fly wheels on which all driving pulleys are located. Through this arrangement all clutch and counter shaft problems are eliminated.

Eight accumulators are located in the accumulating houses which insures efficient separation and absorption of all vibration between stages.

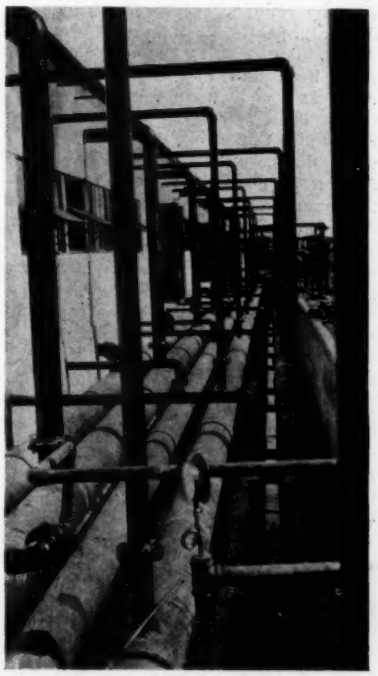
There is approximately 400,000 gallons of gasoline storage to handle the production of the Empire plant. From this storage, gasoline is pumped to the loading rack, through a welded line, to the Santa Fe railroad at Shidler, Oklahoma, four miles away. In addition to the regular equipment of the plant, a laboratory has been installed which is equipped to follow up on all phases of plant operation.

The designers of the plant do not claim it to be a model plant. It was not the idea of the construction engineer to build a plant which might be termed a model one but they had in mind a plant which would be better adapted to the location and one which could be moved in case an adequate supply of gas was lacking.

Catalog on Measuring CO_2

Measuring CO_2 electrically is the subject of a catalog recently published by The Brown Instrument Company, Philadelphia, Pennsylvania. This discussion is of special importance to the refiner since it deals with a question that involves the loss or saving of much money.

A paragraph from the introduction states that "Boiler efficiency depends primarily on combustion. The efficient combustion of fuel requires an accurate knowledge of the products of combustion. The measurement of the percentage of carbon dioxide existing in the flue gas is generally accepted as being the most dependable indication of the conditions under which combustion is taking place. Both excess and insufficient air supply result in a reduction of the percentage of CO_2 with an accompanying loss in the economy of power plant operation."



Intake and discharge headers in open pit accessible to workmen at all times.

The catalog contains 16 pages of similar information. Copies may be obtained from the company.

Fractionating Apparatus Has Advantages

New type condenser tower for continuous operation has several new features

By Ernest Owen

THE recent small margin of profit between the cost of production of refined products and their selling price has brought to the attention of refiners more forcibly than before the necessity of more efficient and economical methods in refining petroleum. Probably next to the cracking of heavy fractions for the production of gasoline, the subject of improved methods of distillation and fractionation has occupied the attention of the petroleum industry more than any other during the past year or so.

Regarding existing methods, only about a year and a half ago Leslie in his book "Motor Fuels" stated: "The crude methods of distillation now in such general use in petroleum refineries bespeaks the urgent need of consideration by refinery engineers of the fundamental principles of distillation. Many apparatus now in use would never have been built had the designers had so much as a clear qualitative understanding of basic principles. The fallacious reasoning that since extremely sharp separations are not required in the preparation of petroleum products, almost any kind of plant equipment is good enough, has deadened the interest of engineers in fundamental theory and resulted in stagnation. The postulate is nonsense, for correctly designed apparatus is flexible, effective and efficient and will accomplish with care what is now too often done with difficulty and excessive cost."

The writer, several years previous to the publication of the above statement, had reached the same conclusion and set out to devise an apparatus for the fractionation of petroleum that would be in accord with the fundamental principles of thermodynamics and physical chemistry, rather than attempting to follow blindly precedent in the petroleum industry, and perfect a piece of equipment which from a purely mechanical standpoint might be excellent, but nevertheless scientifically was basically wrong.

In 1920, he applied for a patent, which was recently issued (Aug. 19, 1924) under the number 1,505,798. The assumptions made at that time have been fully borne out by data and articles published since then.

Fractional distillation and condensation is based on the fact that in vaporizing mixtures of petroleum hydrocarbons, the vapor is richer than the liquid in the lower boiling component, the composition of the vapor varying with the composition of the liquid and the individual vapor pressures of the components of the mixture. That is, for a given temperature and pressure condition, the percentage of the light constituents in the vapor bears a direct relation to the proportion and volatility of the light constituents in the liquid. It should be clearly understood that if we heat a mixture of hydrocarbons to a relatively low temperature, not only will low boiling point hydrocarbons be evolved but also a certain amount of heavy vapors will appear in the vapor, and vice versa if we cool a mixture of hydrocarbon vapors through a small temperature range a certain percentage of the relatively light hydrocarbons will be condensed along with the heavier hydrocarbons.

It is for this reason that the ordinary type of fractional condenser tower, which depends simply on either air or liquid cooling for the separation of the heavier "cuts" does not produce homogeneous or sharply defined fractions, but a fraction that requires rerunning in order to obtain a marketable product. The atmosphere cooled type of tower is especially inefficient owing to changing weather conditions, which causes a marked variation in product obtained from a given tower.

Since the separation of hydrocarbon vapors by simple fractional condensation is incomplete, means for its improvement must be developed.

Let us consider for a moment what constitutes the essential features of an ideal fractionating apparatus and what should be expected of it in separating a mixture of petroleum vapors into its different constituents.

1. It should be composed of a series of units, each unit yielding a distinct, homogeneous product of the desired characteristics, (gravity, boiling points, etc.).

2. The different units should be flexible in operation, so that by suitable regulation the character of the fraction obtained from any unit can be changed to suit varying market conditions.

3. The apparatus should be as efficient as possible from a thermodynamic standpoint; the heat given up by the condensing vapors, being used to heat the oil that is to be vaporized.

4. It is desirable that the apparatus should be automatic in operation, adjusting itself to variations in the character of the charging stock and to the rate at which the oil is fed into the system and to changes in temperature of the oil in the distilling apparatus.

5. The total cost of the apparatus should be such that it will yield at least a reasonable return on the investment.

How far these features have been realized in the apparatus covered by the writer's patent, will be seen as the different parts and functions of the equipment are described.

Fractional distillation and condensation may be carried out either continuously or intermittently, the continuous system however possessing so many well known advantages over the batch type of process, that the equipment was arranged for continuous operation. The vapors from the distilling apparatus, after leaving the "stripping tower" (to be described later), passes through a series of units, where they are gradually cooled, each unit condensing progressively lighter hydrocarbon fractions.

Each unit comprises a liquid cooled condenser (which is divided into two parts) and a rectifying tower. Each plate or compartment of the rectifying column may be considered a small still, in which the source of heat is the hot vapors coming from below, and the cooling element is the cooler liquid from the plate above. (Walker, Lewis & McAdams) "Principles of Chemical Engineering."

In order to be efficient, the vapors introduced at the bottom of the column should flow counter-current to the liquid reflux, while in intimate contact with same, since true counter-current action in any sort of process involving heat interchange is necessary in order to secure the best results. The liquid and vapor should be in equilibrium with each other at every point of the coumn, the ascending vapor becoming poorer and the descending liquid richer in the higher boiling component. As the result of a succession of distillations and condensations in the tower a practically pure product may be drawn off the bottom of the rectifying column through a trap to a cooler, while the vapors leaving the unit have been stripped of all the desired heavier fractions.

Furthermore, the column should be well insulated since as Professor Robinson states in his excellent book "Fractional Distillation" (pub. 1922): "The most efficient results are obtained when the quantity of reflux passing through the column is a maximum throughout the entire length of the column. Therefore the best type of fractionating device would be that type which depended entirely for its supply of refluxing liquid from a reflux condenser situated above the column and which itself suffered no loss of heat and therefore intermediate condensation throughout its length."

In this connection I might mention that attempts to withdraw intermediate condensates from various points of the tower have not met with any appreciable success in practice, since when this is done the column is thrown out of balance, due to the difficulty in maintaining the necessary concentration gradient through the apparatus.

A number of types of distributing and

contacting means may be used in rectifying columns, as inert solids (e. g. tile, spiral rings, Raschig rings, etc.), various forms of perforated and solid steel plates, and bubble caps; the latter however giving much the best results. Prof. Robinson speaking of towers used in the various industries, states in his book that "the most up-to-date designs of fractionating stills invariably use this type of column." (i. e. the bubble cap).

Taking up now the reflux condenser it is highly desirable from a fuel economy standpoint, that as large a percentage as possible of the heat given up by the condensing vapors in the reflux condenser, be utilized to heat the charging stock. This may be accomplished by passing the charging stock through the reflux condenser (marked "exchanger" on patent drawing) countercurrent to the flow of vapors through the system.

The temperature of the cooling or charging oil flowing through a given unit shou!d approximate the final temperature of the condensing vapors leaving the unit, as a sudden chilling of the vapors tends to throw down some of the more volatile components of the vapor mixture, which should only be condensed further along the line. This would cause a "vicious cycle" within a given unit.

When we consider that the surface of the heat exchanger once installed is permanently fixed, it will be realized that with varying quantities and temperatures of charging stock through the various units and the desirability of being able to vary the product from a given unit to meet market conditions, it is very difficult (even with automatic control) to effect that delicacy in control of the cooling medium so essential to efficient partial condensation.

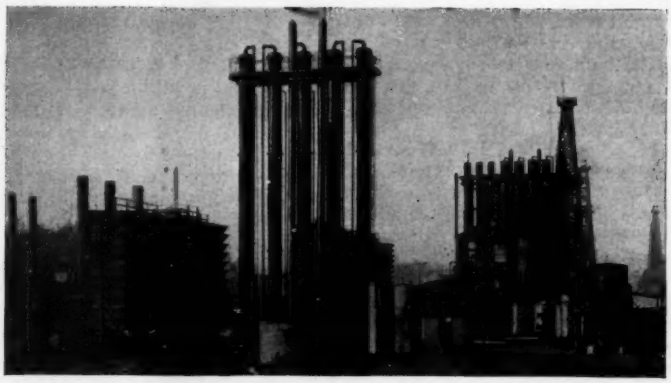
To remedy this condition, it is advisable to split the work of the reflux condenser between two pieces of apparatus, the primary condenser acting as a heat exchanger and performing most of the work of cooling while a superimposed water cooled condenser (marked "dephlegmator" in patent drawing) condenses out the balance of the predetermined fraction.

The temperature of the vapors leaving this secondary condenser can be maintained practically constant by automatically controlling the admission of cooling water to same, through the means of a thermometer bulb installed in the outgoing vapor line. The thermostatic controller can be set to maintain any desired temperature in the vapors leaving the unit, being changed when it is desired to vary the product from the unit. For further information regarding this feature, the reader is referred to an article by W. C. Begeeb-ing on "Temperature Regulation for Towers", published in the November 1924, issue of "The Refiner" and in other oil magazines.

There is a certain amount of condensed vapor, suspended as a mist in the vapor, which will be carried over

(Continued on page 24)

GASOLINE ABSORPTION PLANTS



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Distributing Acetylene on Magnolia Line

Stationary generators and pipe lines accomplish economic cheaper welding energy

By G. O. Carter,
Consulting Engineer

LAST spring when considering the problem of oxwelding the long pipe line for natural gas, which was to be built in Eastern Texas, one of the unsolved problems was the distribution of acetylene. The president of the Magnolia Gas Company, F. M. Lege, Jr., who had made a very careful study of welded pipe lines, commented on the cost of moving the acetylene generators along the right-of-way. He suggested that we try to find some way of cutting down the number of teams and the labor required for this operation. As a result of the study given to this problem it was decided to keep the generators at a fixed position during working hours and to supply acetylene to the welders by means of a small pipe line.

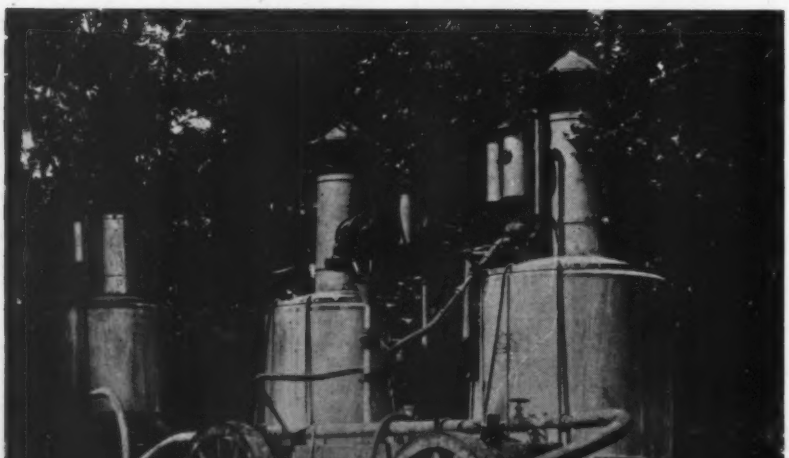
Previous practice has been to have a portable generator mounted on a wagon which would be hauled from welding station to welding station by a team of mules. The single generator would supply four welders, when working on pipe with ⅜-inch walls. The average welding crew consisted of four such gangs working from individual generators, and five other men making tie-in welds, using portable equipment.

Teaming Expensive

In fair weather there would be a team hitched to each generator wagon; two teams to the portable welding outfits, and two teams on tank wagons hauling water for the generators. If the weather should become bad extra teams would be required for moving the generators—as many as four teams having been hitched to a single generator wagon at times.

By having the generators stationed in one spot during the working hours, the number of teams required for handling the gases has been reduced by at least five. In some cases even fewer teams will do the work. For instance, tank wagons for hauling water will not be required when small gasoline-driven pumps can supply the water from a convenient creek or pond. In East Texas water is generally scarce during the summer and it is necessary to haul water some distance.

It is quite apparent that generators must be moved at some time or other as work progresses. In the system now being described this was done immediately after working hours. Generator wagons were moved by Fordson tractors, Holt caterpillars or teams, whichever happened to be most convenient. Some time during the day the head generator man walked ahead far enough to spot a suitable site for the next set-up. He would then walk back to locate and mark a suitable road for moving the equipment. By a little planning it soon became possible to move the generators in an hour. The cost of moving must, of course, be charged against the acetylene distribution.



A unit of four generators, mounted in pairs

Size of Pipe

After a study of the volume of acetylene required for 16 welders, it was decided to use 1½-inch pipe for the supply line. At first this was made up in 100 foot sections, but it was shortly decided to handle it in lengths of 200 feet. Brass outlet plugs were bronze welded to the steel pipe at approximately 17½-foot intervals. No valves were used on these outlets—they were merely closed with a cap nut. At each end of the pipe a Muller stopcock was used to prevent the loss of acetylene and mixing of air. Connections were made by means of common unions.

The procedure for handling the acetylene pipe line is as follows: After the welders have passed a section, the joint is broken and the front end of the pipe is tied to a wagon (sometimes to a single-tree). A team of mules would then drag the pipe to the front end of the acetylene pipe line where it would be connected up. One team and one or two men are required to move and keep the acetylene supply line in condition.

In the old practice of using single generators, each one with its own team, it was necessary to have a generator man to operate each generator. Under the new plan, with four generators in a fixed position, one generator man and one helper easily took care of all.

When it was decided to use one acetylene supply line with several generators feeding it, there was much doubt as to the regularity of the feed from the generators. It was the belief of nearly everyone familiar with the problem that one generator would tend to carry too much of a load and the others would be working below capacity. In an effort to control the flow of gas from the generators, four flow meters were ordered for the first installation, but these were so low in capacity that they could not handle the volume of gases. In the meantime it was found that the problem was not as serious a one as anticipated. Six sets of four generators each have operated for weeks at a stretch with no trouble from this source.

Time Saving

When generators were moved singly after each series of welds, the welders

Generators were hauled into position with Holt Caterpiller or Fordson tractors.

would collect their equipment and place it on the generator wagon; then when they had reached the new welding station would uncoil their hose and get set for the next joints. When using the acetylene supply line, the welders disconnect the oxygen regulator from the oxygen cylinder and the acetylene hose from the acetylene line, and then carry their equipment to the next nearby station and hook it up. Welders therefore lose little time in moving their equipment, and they could be counted upon to put in a certain definite time of welding every day. Under the old plan when generator wagons would have difficulty in moving across wet fields or have to go around creeks and ravines a great deal of welding time would be lost.

Another advantage of the acetylene supply line, was that it permitted an entirely different grouping of welders. With single generators, four is the maximum number of welders who can get a steady supply of acetylene, but with three generators always feeding into a common line it has been found entirely satisfactory for as many as twenty-five welders using No. 10 Oxweld heads to work off the system. This seems a little contrary to general acetylene practice, but it was watched very carefully by engineers who were familiar with the requirements for proper generation of acetylene. However when No. 12 Oxweld heads were substituted for No. 10 heads, the load was so heavy on the generators that two additional generators were added to one welding crew, which had much heavy welding work ahead.

It was estimated that the change in the method of supplying acetylene resulted in a direct saving of $25.00 per day per gang on the Magnolia Gas Company's welded line. Other savings both direct and indirect amounted to a great deal more.

Considering how the application of the welding process is growing so as to require larger and larger welding gangs, it is obvious that we should give a great deal of study to problems of the above nature in order to reduce the ultimate costs which are chargeable to the use of the welding process.

Acetylene supply line shown at the right.

G-R Bentube Evaporator Offered Refinery Trade

An apparatus designed for the production of pure distilled water for boiler feed makeup, is announced by The Griscom-Russell Company.

Essentials of this apparatus consist of a shell and vapor dome of welded steel plate with tube headers of cast iron into which are expanded seamless drawn Admiralty tubes which are bowed. Steam enters the tubes and evaporates the raw water in the shell. These bowed tubes distort with temperature changes, effectively cracking off accumulated scale. The tube bundle consists of a series of independent vertical sections, each easily removable for inspection.

This method of water purification eliminates all scale-forming material from the water before it enters the boiler, thus considerably improving plant operation.

The G-R Bentube Evaporator is manufactured by The Griscom-Russell Company, 90 West St., New York City. Complete information concerning the evaporator is contained in Form 195 which will be mailed to anyone interested.

Kinney Pump Bulletins

Pumps especially adapted to the petroleum industry are featured in literature published by the Kinney Manufacturing Company, Boston, Massachusetts.

Kinney Pumps have found wide distribution in refineries throughout the country and have built up splendid reputations for serviceability.

There is a Kinney pump for every need of the oil man from field service to loading and unloading tankers.

Further information and complete literature will be supplied by the company upon request.

Cement Booklet

The Atlas Lumnite Cement Company, 25 Broadway, New York City, has recently put out a booklet on 24 hour concrete. It is claimed by the company that this cement develops at 24 hours, greater strength than that developed by ordinary cement in 28 days. The cement has wide application to the petroleum industry and is finding favorable distribution.

Further details will be supplied by the company.

New Mexico Plant

Through a deal recently closed between the Santa Fe Company and the Munoz interests and the Mutual Oil Company of Denver, a refinery is contemplated to be located at either Aztec or Farmington in New Mexico. The refinery is to have an initial capacity of 250 barrels daily and will operate on crude from the Rattlesnake dome area in the Navajo Indian reservation.

Fractionating Apparatus Has Advantages

(Continued from page 21)

mechanically from the reflux condenser into the succeeding unit, unless provision is made to remove it. By interposing a separator or "purifier" in the vapor stream as it leaves the reflux condenser, a clean, dry vapor, uncontaminated by any high boiling point liquid particles will be delivered to the next unit.

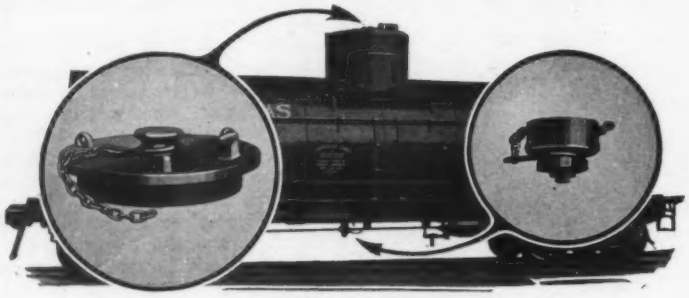
Having determined upon the type of equipment for the fractionation of the vapors from the distilling unit, let us next consider where we shall introduce our charging stock into the distilling unit and from what point we shall withdraw our residue or "bottoms". If the oil in the still is of the same composition as the charging stock, it is evident that if we draw off continuously a portion of the oil as residue, a considerable portion of the lighter constituents will find themselves mixed with this residue, no matter how the distilling unit proper is constructed.

It is therefore desirable to introduce a stripping tower between the distilling apparatus and the first fractionating unit. The charging oil after passing through the series of exchangers comprising the reflux condensers of the different fractionating units, may be further heated, if desired, by passing it through an additional heat exchanger through which residue from the still flows countercurrently. The charging oil generally containing considerable vapor, is then discharged into the top of a "stripping" tower, which is constructed in a general way the same as the rectifying columns previously described. As the liquid flows down through the stripping tower on its way to the distilling apparatus, ample opportunity is afforded for the clean cut separation of the heavy liquid and the vapor. The heavy vapors from the distilling unit move upward through the column, establishing a succession of near equilibra with the descending liquid. In order that the character of the vapor leaving the stripping tower be under accurate control, an automatically operated water cooled reflux condenser and separator is superimposed on top of the stripping tower.

By the time the charging stock had reached the distilling unit proper most of the "overhead products" should have been vaporized and passed on to the condensing system, so that the oil delivered to the still approximates the composition of the residue, most of the separation having taken place in the "stripping coumn". This residue should be removed continuously from the distilling unit.

The construction of the distilling unit is not covered in the patent, but I believe that oil stills in the future, when they are not of pipe construction, will (except in special cases) be modeled along the lines of "water tube" boilers used in steam practice.

In conclusion, it may be said that fractionation carried out along the lines described in this article is not only highly efficient, flexible, easily controlled, avoiding the handling and rerunning of intermediate distillates; but through better separation actually increases to a marked extent the yield of the lighter fractions from a given charging stock.



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Western Iron and Foundry Co.

Wichita, Kansas

Granfield Refinery Operating Full

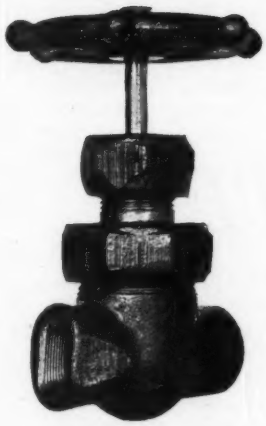
Granfield, Ok'a.—The Bell Oil & Gas Company is operating the Granfield refinery near here at full capacity, running 3,000 barrels per month of Texas crude. The Bell company is also selling the output of the Moore Refining Company at Arkansas City, Kansas, which is now running approximately 5,000 barrels per day.

Change in Barnsdall Plant

Barnsdall, Okla.—William F. Dieterman has been made assistant superintendent of the Barnsdall Refining Company here, succeeding W. T. Coffey, who recently resigned to become affiliated with the Cushing Oil & Refining Company at Cushing.

Robert B. Leydig of Bartlesville, Oklahoma, has gone to Rangoon, Burma, India, to direct the installation of a Cross cracking process for the British Burma Oil Company, Limited.

proving a surplus of strength



SMASHED cold by the powerful blows of a 5000-pound steam hammer —without developing cracks or any other defects. This most severe test proves that Vogt Drop Forged Steel Valves and Fittings have a surplus of strength — strength in excess of that required for any possible service.

Examine carefully the unretouched photographs of the tee, flange and union bonnet valve, and note particularly that even the threads did not fail.

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DROP FORGED STEEL VALVES AND FITTINGS

Their surplus strength is insurance against failure in most severe service and the resulting loss of property and even life.

Vogt Drop Forged Steel Valves have working pressures to 6000 pounds per square inch, and fittings have working pressures as high as 10,000 pounds. Those designed for high temperatures are used successfully to 1100 degrees F. Valves are steel trimmed or monel metal trimmed according to service requirements.

Globe, angle and check valve sizes are from ¼ to 2 inches, gate valves from 1 to 6 inches, fittings from ¼ to 4 inches and companion flange sizes from ¼ to 8 inches inclusive.

Detailed information regarding these and the many other items that make up the line of Vogt Drop Forged Steel Valves and Fittings is contained in the new catalog now on the press. Write for a copy

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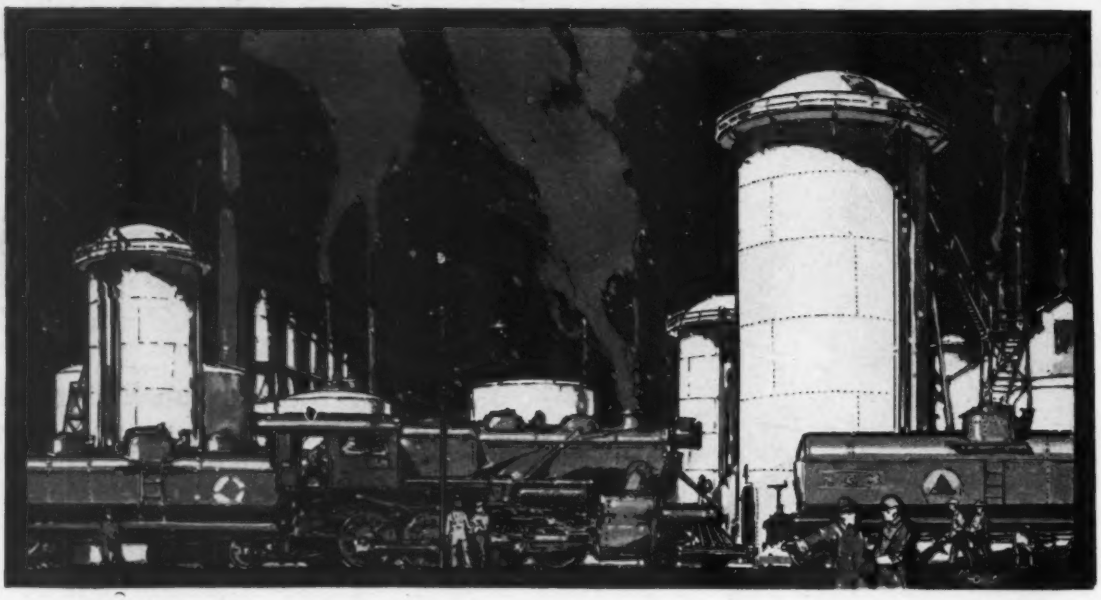

Best for Wear and Weather

Tank cars suffer the worst treatment of all refinery equipment. Vibration, expansion and contraction, abrasion, and the worst weather conditions are defeated only by the proper paint protection.

STEEL-KOTE

for tank cars is the most economical and efficient paint because it is practical under modern shop conditions, covers better and spreads farther than ordinary paints. It dries under all sorts of weather conditions—and it wears!

STEEL-KOTE over a proper priming coat means a tough, elastic film of excellent protective qualities, preventing rust, pitting and corrosion. The black shade is preferable and is generally used as a top coater. Most economical because it serves longer and better.

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NEW EQUIPMENT. CATALOGS. BULLETINS. BOOKS

Multi-Syphon Ventilator Made by Wichita Concern

So as to combat the presence of gases and fumes in oil refineries the Buckley multi-syphon ventilator is being manufactured and sold by the American Cornice Works of Wichita, Kansas, who also supply the ventilator to other industries as well.

An outstanding feature of the Buckley multi-syphon ventilator is its high

exhausting power as it has no obstructions on the inside and no moving parts to get out of order.

Having as its sole function the expelling of dead air and maintaining a free movement of pure, fresh air throughout the building or structure equipped with it, the Buckley ventilator is made with a series of several vertical rows of vents, or openings that extend entirely around the inner shell or base thereby offering a maximum of syphoning power. This regulates and makes possible a steady air-exhaust upon the quietest day or during the most severe windstorm.

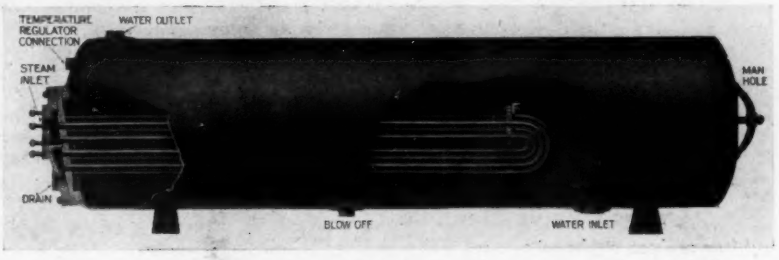
The dead air in the room or building equipped with the Buckley multi-syphon ventilator is syphoned from the room in a steady, never-varying flow.

Griscom-Russell Company Announces Heat Exchanger

A novel design of heat exchanger for oil refinery use is announced by The Griscom-Russell Company.

By using two short exchangers connected by a flexible bend and shell cover, a compact, rugged, readily portable, and easily installed unit is obtained, approximately half the length of a single unit designed for equivalent duty.

This twin arrangement also divides the tube and shell expansion between



Russell U Tube Storage Heater

two units, and makes inspection and cleaning much easier.

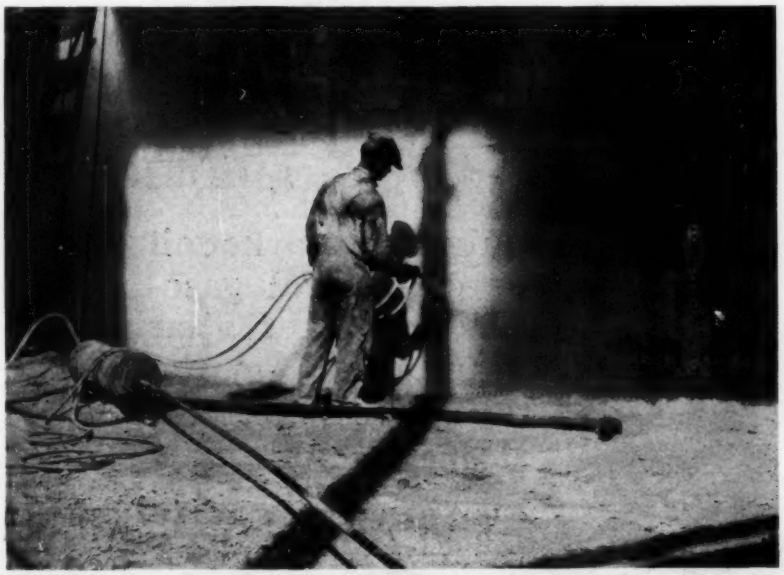
In this exchanger, the cooling liquid and the liquid to be heated flow in opposite directions for most efficient exchange of heat. Two styles of baffles are used to guide the liquid around the tubes, the selection depending upon the allowable pressure loss in the shell. All oil connections are at the same end to simplify piping, and floating heads and head covers eliminate strain on tube heads and prevent danger of cracked tube plates.

Complete information on these Twin Multiwhirl and Twin Vaneflo exchangers can be obtained by writing to The Griscom-Russell Co., 90 West St., New York, for a copy of Form 201 which has just been published.

Pure Oil Company Uses Spray System In Painting Large Steel Storage Tanks

The following information on painting storage tanks by compressed air is taken from the Pure Oil News. It concerns work done at the refinery at Smith's Bluff on the Neches river below Beaumont:

"Each 55,000 barrel tank has a surface of approximately 21,300 square feet. This area is covered by a crew of three men in a total of three days including the moving of equipment. One man mixes and carries the paint, one man operates the 'paint buggy' and one man handles the gun. The work was done with one Matthews spray gun, securing an average coverage of 550 square feet per gallon of paint and an average coverage per eight hour day of 10,500 square feet. The air was furnished from our compressor house when possible but if the tanks were too far distant the paint crew used an Ingersoll-Rand compressor. The total cost of painting a 55, including foremans' salary, is approximately $75 per tank."



Painting a tank with the spray gun.

The control element is placed in the reservoir through this opening and actuates a cut-off valve to be placed in the steam line adjacent to the steam inlet. This arrangement operates to open the valve and admit steam to the heating elements when the temperature of the water falls below that desired, and closes the steam valve when the water reaches the proper temperature.

Further particulars may be obtained by communicating with the Griscom-Russell Company.

Oxweld Company Offers Oxygen Valve Manifold

After a close study of several different designs, the Oxweld Acetylene Company has developed a valve for an oxygen manifold which is declared to be satisfactory.

This valve has a swivel tip on the stem. The body has a formed seat receiving the stem tip. This tip is attached to and is carried by the stem by means of a swivel joint. Thus the tip is enabled to seek its own natural seat in the body. The stem screw is in the inner end of the stuffing box, which is made gas tight into the body by means of the lead gasket. The stem itself is made gas tight by the rubber packing which is compressed between packing rings, by means of the hand wheel and nut.

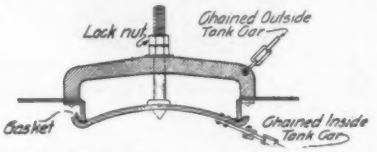
The valve is fool-proof. If the operator should happen to unscrew the hand wheel all the way, there is no possibility of the internal parts being blown out by pressure, because the stem screws into the stuffing box. Even if he should unscrew both the stem and the hand wheel, the parts could not come out because the large end of the stem would lodge against the inner end of the stuffing box.

More detailed information will be supplied by the Oxweld Acetylene Company, Carbide and Carbon Building, 30 E. 42nd St., New York City.

Lock Nut On Stud Bolt Protects Tank Car Cover

Difficulties experienced by shippers of natural gasoline in preventing internal swinging dome covers of insulated tank cars from becoming damaged when returning as empties can be overcome by placing a lock nut on the stud bolt of this cover, according to J. A. Martin of the shipping department of the Lone Star Gas Company, Dallas, Texas.

Even when these covers are carefully tightened by screwing down the regular type of nut on the internal cover bolt after being unloaded, the vibration of the empty car when in motion will jar this nut loose, causing the cover to fall inside, and wear the threads on the bolt to such an extent that repairs must be made before the car goes back into service. The damaged stud bolt can be worked over with a die for a few times, then it becomes necessary to re-thread to a smaller size, and finally



Sketch showing lock nut in operation on the stud bolt of an internal swinging dome cover

a new bolt has to be put in at a loss of time and some expense. Besides the expense involved in making repairs to this stud bolt, there is a serious hazard in transporting open empty gasoline cars.

All this can be eliminated by making use of a lock nut on the stud bolt. However, the gasoline shippers must continue to stress the importance of the internal swinging dome covers being closed and screwed down tight by the lock nut when the unloading crew have completed their work.

Testing Machine Catalog

Bulletin No. 2, by the Tinius Olsen Testing Machine Company, Philadelphia, Pennsylvania, describes various types of testing machines for laboratories.

Olsen machines have been used for many years as standards in testing equipment and need no words of commendation as their record and almost universal use speak their worth.

A copy of the bulletin will be furnished anyone by writing the company.

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We make and market all grades of natural gasoline. You can get what you want, right on the dot, when you entrust your order to Akin.
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All refinery equipment can be packed successfully with one of these five packings, regardless of pressures or temperatures.

"John Crane" Style No. 100

"John Crane" Style 100

This style of packing is made of babbitt foil. It bends as easily as flax. It compresses easily under gland pressure. Each layer of foil is separated by oil and graphite.

Manufactured in 10 foot lengths. It is spiralled and comes in sizes 1/16" to 1½". It is cut easily with a knife and engineers mold their own rings.

Thousands of pounds of this Style 100 finds its way to centrifugal pumps handling oil, crudes, distillates, and gasoline. There is one Texas Station which has been packed for eight years, against 800 lbs. pressure, and the plungers have never been overhauled, and the rods are still polished. For temperatures not over 400° F.

"John Crane" Style No. 200

"John Crane" Style 200

Over a core of the highest grade asbestos is wrapped spirally a cover of copper foil. It is flexible and compressible. It is especially designed for high temperature work up to 1200° F.

Manufactured in 10 foot lengths. Spirals come in sizes from ⅛" to 1¼".

Recommended for valves and expansion joints on high temperature oil lines or superheated steam lines. When Style 200 is combined with Style 500 the packing forms one of the best packings for hot oil service, hot tar or hot residuum oil. Used extensively on valve stems where casing head gasoline is manufactured.

"John Crane" Style No. 300

"John Crane" Metallic Channel combination Styles 300 and 400

Designed especially for rods subject to vibration or slightly out of align. Has a resilient asbestos channel back and a metal insert of Style 100 stitched firmly in position. Is flexible and compressible.

Manufactured in 12 ft. lengths. It is spiralled, and comes in sizes from ⅜" to 1¼". Is cut with a knife, and rings can be easily formed.

Suited to steam rods of oil pumps or water pumps. Will pack air compressors and valve stems and expansion joints on steam, air ammonia gas or other gases.

"John Crane" Style No. 500

"John Crane" Style 500

A core of soft copper wires in a cover of spirally wrapped copper foil. Impervious to the highest temperatures.

Manufactured in 10 foot lengths and comes in sizes from ⅛" to 1¼". Gives excellent service where hot oil, sticky or thick residuum oils are being handled under high temperatures.

"John Crane" Style No. 400

Made with a resilient duck and rubber channel back with metallic packing Style 100 as an insert firmly fastened by stitching. This packing presents a metal face to reduce friction and polish the rod.

Same sizes and lengths as Style 300.

Is highly suited for plunger boiler feed work or cold water service. On ammonia rods it has no equal, either reciprocating or rotary. It is used very extensively for oil plungers pumping crudes.

INVESTIGATE NOW! Every refinery and pipe line superintendent should have on his desk our text book, **"METALLIC PACKING."** It is absolutely free to those engineers who wish to cut down their packing cost and overhauling charges and secure long life packing service.

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Executive
Superintendent
Other Employee

Natural Gasoline Plant
Executive
Superintendent
Other Employee

(BE SURE TO CHECK CLASSIFICATION)

Concrete Is Plant Item Worthy of Study

(Continued from page 15)

chase price of aggregate is not as important as quality—in the case cited, the cost of aggregate was $2.40 per yard, but in one a value of $4.91 per yard was secured, basing the value of the other at cost or $2.40.

When a gravel or stone plant takes a 1½" product and screens out all material below, say ¾", one yard of 1½" increases to 1½ yards or more of both sizes separately, and one yard of either is cheaper, but concrete is sure to cost more money with the screened out aggregate than with the graduated aggregate.

There are few crusher run stone aggregates and still fewer bank run gravel aggregates that have a perfect, or even a near perfect graduation of sizes. To secure graduation, the product must be screened into various sizes and then mixed in the correct proportions for a given job. Where various classes of concrete are required, as mass concrete for foundations of large dimensions, wall foundations, engine foundations and other heavy work where 1½" aggregate may be used; flat slab floors, beams and slabs, footings, columns, girders and other moderately heavy reinforced work ¾" aggregate may be used and for thin sections, reinforced with expanded metal or wire mesh, such as light floor and roof slabs, partitions, walls, ½-inch aggregate.

The proportions usually specified for various work are:

Mass work, where weight and footing is required in excess of strength, 1:3:6.

In foundation walls, small engine foundations, 1:2½:5.

For large gas engine-compressor foundations, beams, girders, pilaster footings, counterfont and buttress work, columns, and any work subject to live load or vibration, 1:2:4.

For spray pools, water tanks, floor paving, one course, 1:2:3.

And for all members requiring extra strength such as base columns, 1:1½:3, or even richer, 1:1:2.

All these proportions are for reinforced work.

It must be remembered that the percentage of voids affects the proportions of mix, though, and where the voids in the aggregate are high, these proportions may require changing, to include more cement.

Machine mixed concrete shows greater uniformity of properties than hand mixed, although machine mixing must not be done hurriedly. Not less than one minute should be the mixing time, and the concrete should be immediately placed after mixing, by two-wheel carts or barrows, or even better by spouting, if the job is large enough to justify spouting equipment.

When poured into forms, close contact with reinforcing and smooth interiors can be obtained by using a slicing tool or straight shovel, moving it up and down in the concrete. By running the slicing tool to spade large aggregate away from the forms, a smooth, dense surface will be had when the form is removed.

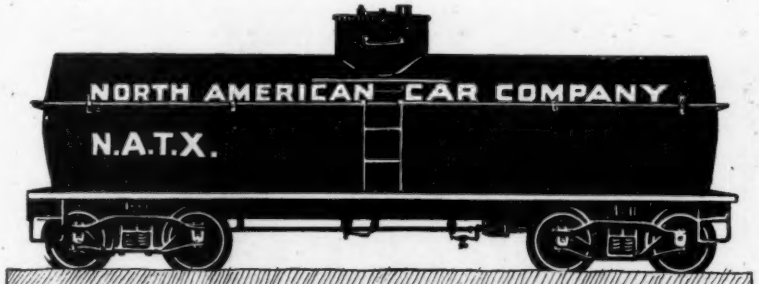
Forms may be removed after concrete has hardened sufficiently; low atmospheric temperature retards setting. The various parts of a structure require forms to be left in place from 3 days for columns at 60 degrees F. to 10 days at 40 degrees F. to 24 days for beams at 40 degrees F.

If freezing occurs, tests must be made to insure that the concrete has set.

In dry weather, concrete may dry out too rapidly, losing strength. To prevent this, the work should be sprinkled at intervals during the day for periods of 10 days to 2 weeks, depending upon atmospheric conditions. A layer of sand retains moisture and when the work can be covered and kept moist for 10 days, cement will indurate or bond more closely with sand and aggregate, securing hard dense finished work.

In the design of engine foundations, with stepped footings, flywheel pits and other details requiring angles in the concrete, the angles should be joined with fillets to prevent cracking in the angles.

And all work to secure uniform, hard, dense, good concrete, must be done under careful supervision of competent men, experienced in concrete, whether the job is large or small, if the work is to be permanent.



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Absorption Process
Maintaining High Rank

(Continued from page 14)

This water, when the supply is limited, can be cooled by circulation over an atmospheric cooling tower where a partial evaporation of the water absorbs the heat for cooling. Under ordinary conditions of wet bulb and wind velocity, a temperature of 75 degrees can readily be had with the standard type of cooling tower. When, however, the atmosphere is dry as indicated by a low wet bulb temperature and with a good wind velocity, lower temperatures can be had. The overloading of a tower is to be avoided as this reduces the amount of cooling by cutting off the air circulation.

For best economy, a wide louvre type of tower is desirable as this design will keep losses from misting to a minimum without cutting off the area for air circulation. Height and exposure are the primary factors to give a long time element and largest amount of comparatively dry air within the tower. All cold water then has its source in the bottom of the cooling tower.

In addition to having cold oil for absorption, the gas passing into the towers must also be cold, at least approaching the temperature of the oil. Heat at this point lowers the absorption capacity.

The cooling is accomplished in units much the same as the oil exchangers and coolers by circulating cold water against the gas stream, the gas passing around the tubes with the water inside. Temperatures to within 5 to 7 degrees of the cooling water are usual practice for gas cooling.

The gas coming from the field after being separated from oil at the wells carries some mist and water vapor, which necessitates placing an extractor in the gas stream after passing through the cooler. To allow the oil or water mist to pass in with the gas would be to constantly add them to the circulating oil where they would be accumulative. Both crude oil and water are conducive to emulsion of the absorption oil when heated and treated with open steam, and cause the oil to foam over into the gasoline condenser. Emulsion also materially lowers the absorption capacity.

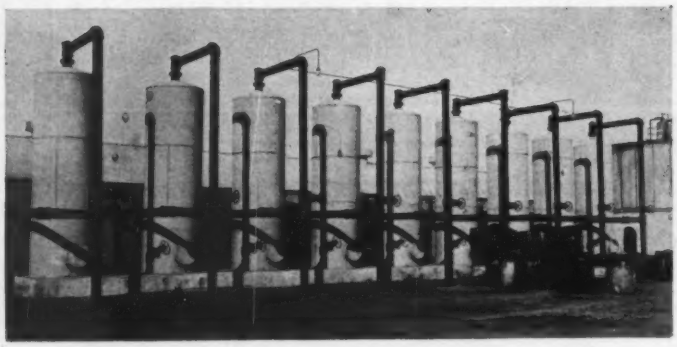
After continued operation of an absorption plant, the oil undergoes a slight change through repeated heating and cooling and the small amounts of crude oil that pass through the extractor. The viscosity will become greater necessitating higher head pressures for pumping and the oil will gradually lose its absorption power. A condition of this kind can only be remedied by a renewal of the entire charge of oil and this measure should be adopted to maintain high efficiency.

The flexibility of the oil absorption method is embodied in the fact that the process is equally applicable to gases of any gasoline content. The amount of extraction is proportional to the amount of oil circulated and the contact with fresh oil. Gases of high quality can be treated in a series of passes through several towers each supplied with fresh oil, while low and average quality gases can be thoroughly cleaned in one pass.

Pressure has the effect of giving higher absorption rates and capacity, but by regulation of quantity of oil circulated and time of contact, absorption can be made to take place at any pressure. In this way, gases of low well pressure can be passed through the plant from their own energy and the expense of compressors avoided. No work is done upon the gas, therefore no efficiency is lost in handling any quantity of gas and when the gas is to be delivered to a distributing system, only a few pounds in head pressure need be sacrificed in treatment.

In view of these advantages, the system has come into almost universal use and there is little likelihood of its being displaced by any other system. The units are usually made up sectional and of no great weight so that in the case of removal of a plant to a new location the salvage value is high.

The system is simple to operate and one man per shift can readily handle a plant of fifteen thousand gallons per day capacity. Being a continuous scheme of extraction, it can be adjusted to a constant and therefore requires very little attention.



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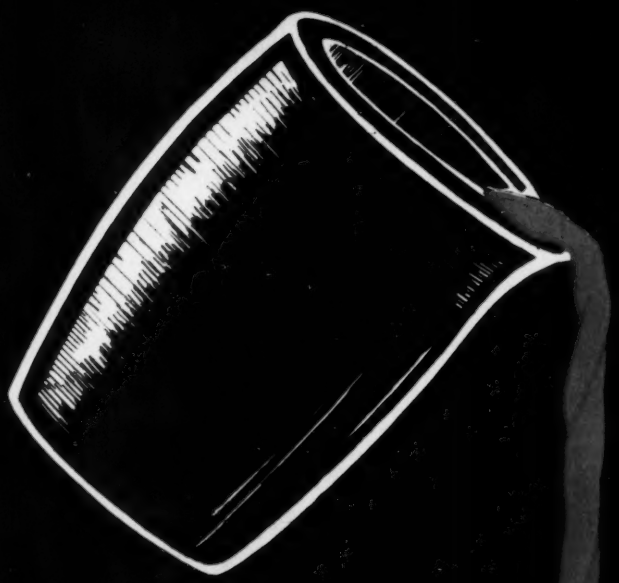

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RECENT REFINERY PATENTS ISSUED

BY STAFF REPRESENTATIVE

Washington, D. C.—The following patents of interest to the refining industry were granted by the United States Patent Office during the month of December:

No. 1,518,555, granted December 9 to Elmer C. Blasdell, Kansas City, Mo., for an apparatus for cracking oil, consisting of a plurality of towers connected in series, valved connections between said towers whereby one or more of said towers may be cut out of the system, a chamber in the lower portion of each tower, a baffle suspended in said chamber, a pipe leading from the upper portion of each chamber and located above the lower end of the baffle for conducting fluid to the succeeding tower, means for externally cooling said towers whereby certain fractions may be condensed, and means in top of each tower for withdrawing the uncondensed vapors.

No. 1,518,684, granted December 9 to Louis Benge, Sterling, Colo., for an apparatus for reclaiming waste lubricating oils comprising an exterior casing, an oil receiving tank disposed in the upper portion of the casing and having a valved, downwardly discharging outlet, a series of downwardly inclined evaporating pans disposed below the tank and discharging one into another, means for causing the oil discharged from one evaporating pan to drip into a plurality of streams upon the pan below, means upon the first pan of the series for distributing the oil discharged onto said pan from the tank, a receiving pan at the lower end of the casing and heating means disposed at the lower end of the casing, and a tank disposed below the heating means into which the receiving pan discharges, the lower end of the casing being provided with an air inlet adjacent to the heater.

No. 1,520,121, granted December 23 to to Henry E. Deckebach, Cincinnati, Ohio, for a process of increasing efficiency of distillation by providing a quantity of crude oil, a mixture of steam and fluid petroleum distillate, withdrawing part of the crude oil admixing crude oil withdrawn from the mass of crude oil with the admixture of steam and fluid distillate and discharging same above the body of the crude oil.

No. 1,520,161, granted December 23 to Frank E. Van Tilburg, Minneapolis, Minn., for an apparatus for separating composite oils into component parts comprising a plurality of main stills connected in series, an auxiliary still in each of the said main stills, the earlier of said auxiliary stills being connected with each other in series, a plurality of separators connected respectively with said main stills for receiving the vapors therefrom, and means for trapping back into said auxiliary stills the condensates forming in said separators whereby said condensates will be redistilled unmixed with the original mass of oil and by the same source of heat employed in the initial distillation.

No. 1,520,493, granted December 23 to Robert E. Wilson, Chicago, assignor to Standard Oil Company of Indiana, for a method of revivifying spent fuller's earth which comprises initiating local combustion in one part of a bed of spent fuller's earth, causing the combustion to progress therethrough by forcing air into the bed of fuller's earth at the point where combustion is begun, and admixing with said air an inert gas to control the temperature obtained in the combustion of the fuller's earth.

No. 1,520,627, granted December 23 to Malcolm P. Youker, Bartlesville, Okla., assignor to Phillips Petroleum Company of Delaware, for a process of recovering natural gas gasoline from natural gas which consists in treating a hydrocarbon mixture to obtain a vapor component, compressing said component in the condition in which it is obtained from said treatment to liquefy the same, and returning the liquid to the sphere of treatment of said hydrocarbon mixture in intimate contact with the hydrocarbon mixture.

No. 1,520,752, granted December 30 to Wilhelm Horwitz, Berlin, Germany, for a method for the recovery of petroleum from oleiferous sand and other oleiferous minerals, consisting in boiling the oleiferous substance with water under pressure, and simultaneously stirring the mixture by jets of hot water under pressure introduced tangentially into said mixture.

No. 1,520,804, granted December 30 to Charles R. Burke, Tulsa, Okla., and Thomas F. Hintze, Arrowchar, N. Y., said Burke assignor of his right to Louise P. Burke, Tulsa, for a method of producing a relatively large percentage of fixed gas and a relatively small percentage of low boiling point by-products from high boiling point hydrocarbons consisting in subjecting high boiling point hydrocarbons to a temperature sufficient to crack at least a portion of the same, separating the lighter vapors from the heavier condensate, condensing the light vapors to form a light distillate or low boiling point by-product, and directly subjecting the heavier condensate without substantial loss of heat at substantially atmospheric pressure to a heat sufficient to decompose said heavier condensate and convert the major portion only of the same into a fixed gas and a substantial minor portion into fuel oil.

No. 1,520,953, granted December 30 to Ernst M. Johansen, Philadelphia, assignor to The Atlantic Refining Company, Philadelphia, for a method of separating an oily liquid from a mixture containing the same and another oily material which is less readily emul-

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sifiable, which consists in subjecting the mixture to a selective emulsifying action, of a solution of a soap and thereby emulsifying the more readily emulsifiable material to a greater extent than the less readily emulsifiable material, and separating the emulsion from the unemulsified material.

No. 1,521,278, granted December 30 to Edgar M. Clark, New York, assignor to Standard Developing Company of Delaware, for a method of refining petroleum distillates of high sulphur content which consists in treating the same with 66° Baume sulphuric acid, separating the treated oil, redistilling to leave a bottom of high sulphur concentration. again treating the distillate with 66° Baume sulphuric acid and redistilling as before, whereby there is obtained a distillate of minimum sulphur content with a minimum refining loss.

No. 1,521,282, granted December 30 to Sterling H. Diggs, Writing, Ind., assignor to Standard Oil Company of Indiana, for a process of refining residual hydrocarbon oil which comprises subjecting the oil to the action of sulphuric acid, settling out sludge, and treating the oil with an aqueous suspension of finely dispersed hydrated lime.

No. 1,521,283, granted December 30 to Sterling H. Diggs, Whiting, Ind., assignor to Standard Oil Company of Indiana, for a process of acid treating hydrocarbon oil for the formation of readily stratifying sludges which comprises subjecting the oil to the action of sulphuric acid; subsequently, and before removing the sludge, adding fuming sulphuric acid to the oil, and separating the resulting combined sludge.

Argentina Contracts For $6,500,000 Refinery

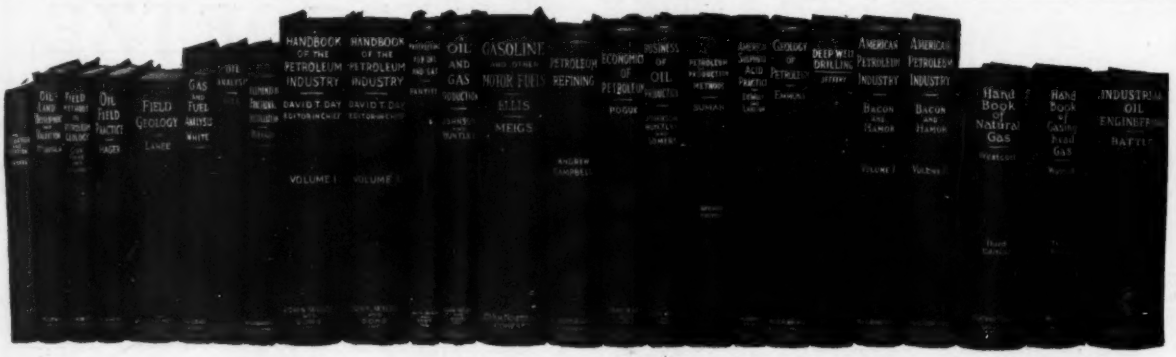
Buenos Aires, S. A.—The Argentine government is projecting a complete refinery to be erected at La Plata in the Argentine that will have a rated capacity of about 14,000 barrels daily and will cost upwards of $6,500,000.

Contract for the construction of the refinery is understood to have been let to the Bethlehem Steel Corporation, a subsidiary of the United States Steel Corporation.

Crude for the new plant will be supplied from the Commodora Rivadavia field in the Argentine which has been in process of development for many years and which now is yielding more than the rated capacity of the new plant.

It is contemplated that the La Plata refinery will be in operation within a period of two years.

Fred D. Capen of Casper, superintendent of The Texas Company refinery there since its construction some two years ago, died January 2 from pneumonia. He was the son of W. M. Capen of New York, a vice president of The Texas Company.



Books on Refining

AMERICAN PETROLEUM REFINING, By H. S. Bell, C. E., Member, American Petroleum Institute; Associate Member, American Society of Civil Engineers; Associate Member, American Society of Mech. Engineers.

A complete analysis of the problem of petroleum refining, giving reliable up-to-date information on every phase of modern American practice. Employes or heads of refineries or oil companies who are in charge of or are planning extensions or modifications to their plants falling outside the scope of their own experience, will find in it the necessary technical data. Supply houses also will find this book of great interest as its discussion of the machinery and material in common use in refineries is unusually thorough and complete. 475 pages, 6x9, 263 illustrations.
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PETROLEUM REFINING, By Andrew Campbell, F. I. C., F. R. S. E., member of the Institute of Petroleum Technologists. Foreword by Sir Boverton Redwood.

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Mid-Continent Refineries Were Running Less Crude to Stills First Day of Year

Tulsa, Okla.—A decrease of 4000 barrels in crude oil run to Mid-Continent refineries was recorded on January 1, under the total for the first day of the month previous. The total runs from the 128 plants reporting show the total on the first day of January as 371,500 barrels.

From the five districts included in the Mid-Continent area a decrease is shown in each with the exception of Arkansas which is showing a slight increase. There is no particular reason allotted to the decrease, except in Texas where the Iowa Park Producing and Refining Company did not appear in the column allotted to "Plants Operating" on account of a fire which necessitated the shutting down of the refinery. The decrease was a natural one in other localities.

In Oklahoma, the Cosden and Company refinery continues to run approximately 30,000 barrels per day as was the case on the first day of the previous month, while the Tidal plant at Drumright has again increased to 4500 barrels per day, its normal output. The shutting down of the Coleman-Nelson plant at West Tulsa and the Lawton Refining Company at Lawton had little effect upon the Oklahoma total, they being small plants The increase in some of the smaller plants in the state served as an offset to this loss. Total runs for Oklahoma for January 1 were 167,200 barrels.

With the exception of the shut down of the Iowa Park Producing and Refining Company plant and the reopening of the Gulf Refining Company refinery at Fort Worth, there is no change in North Texas plants. The Gulf refinery is now running approximately 6000 barrels per day. The Tidal Western plant at Burkburnett has also resumed operations and are running 2000 barrels per day. The total for North Texas for January 1 was 90,000 barrels.

A reduction of 1000 barrels in the daily runs to the Skelly Oil Company's Eldorado plant and a slight decrease in the Sinclair Refining Company refineries at Argentine and Coffeyville were the important happenings for Kansas during December. The Waite Phillips Company will start operations in their Wichita refinery, which was recently purchased from the receivers of the Sterling Oil and Refining Company, about January 15. This plant has just been remodeled and will receive one-half of the production of the Rainbow Bend field in Cowley County when opened. Waite Phillips Company own a new pipe line from the refinery to the Rainbow Bend field. Kansas shows a total of 75,000 barrels run on January 1, the Neodesha plant of the Standard Oil Company (Kansas) running 12,000 barrels of this total.

The 1000 barrel loss in the total for North Louisiana is charged up against the Caddo Central Oil and Refining Company who have made a reduction in the runs of their two plants. The total for North Louisiana is 26,400 barrels.

A slight increase in Arkansas runs which brought the total up to approximately 13,000 barrels, is accounted for by the Ouachita Valley Refining Company at El Dorado running 1500 barrels on January 1, while on the first day of the month previous it was shut down.

Wortham Field Will Get Two More Gasoline Plants

Wortham, Tex.—Two natural gasoline plants are scheduled for erection in the Wortham field. Humble Oil & Refining Company announced late in December that an absorption plant capable of handling five million cubic feet of gas daily would be erected, while the Humphreys-Boyd Oil Company has been previously mentioned as having plans to install a charcoal process in the field with a daily capacity of 20 million cubic feet of gas.

Humble is now operating the only natural gasoline plant in the East Central fields, where oil and gas production is obtained from the Woodbine sand pay, and this plant is located in the Corsicana-Powell field. Humble's plant at Wortham will cost approximately $200,000, and will be constructed so as to operate on very lean gas, as the gas at Wortham yields less than a gallon per thousand, but this recovery will be greater as the wells in the field decline in production.

Portable Refining Company Changes Name and Location

Wortham, Texas.—The removal of the Portable Refining Company's 2500 barrel daily capacity skimming plant from the Luling, Texas, field to the new Wortham field in East Central Texas is to be followed by the change of the name of the company to the Peerless Refining Company. This plant is built on standard gauge railroad car trucks, and is credited with being the first large portable plant ever operated. It has been spotted on a siding of the H. & T. C. railroad about one mile north of Wortham, and has contracted for crude now being produced by the Rio Bravo Oil Company on the right of way of the railroad. H. Englehardt is superintendent in charge of the plant, which was manufactured last year by The Graver Corporation at Chicago and transported to Texas on its own trucks.

A recovery of about 25 per cent gasoline and 20 per cent kerosene is expected to be made by this plant from Wortham crude, according to T. W. Sowell, president of the Peerless Refining Company, while the remainder will be sold by contract as fuel oil to the H. & T. C. Railroad. The Peerless Refining Company is capitalized at $100,000, and headquarters are on the ninth floor, Magnolia Building, Dallas, Texas.

Humble Building Plant In North Texas Field

Wichita Falls, Texas.—Humble Oil & Refining Company is erecting a natural gasoline manufacturing plant in the South Vernon field, Wilbarger County, to handle 2,500,000 cubic feet of gas daily. This plant will be the first in the new North Texas high gravity oil producing field, and wil use the absorption process. Gas produced in this field affords a gasoline yield ranging from two and one-half to three galons per thousand cubic feet. Since the field is about eight miles south of the F. W. & D. Railroad, the production of the plant will be transported via pipe line to a loading rack at the nearest point on the railroad, just east of the town of Vernon.

R. C. Alden, formerly associated with the Landreth Gasoline Company at Ibex, Texas, has gone to California to become head of the research department of the Gasoline Recoveries Corporation. Mr. Alden is the co-author of "Natural Gasoline."

Otto Peters, former head of the Kiefer gasoline plant of the Chestnut and Smith Corporation, has been transferred by that company to their largest plant at Breckenridge, Texas. Mr. Peters is chief engineer at the Texas plant.

November Shipments of Gasoline Below October Level; New Plants Building

Fort Worth, Texas.—Natural Gasoline shipments from North and Central West Texas during November showed a slump in comparison to the average maintained during 1924, but this decline is largely due to a reduction in gasoline movements from plants in Eastland County. Market conditions during November contributed to the slump in shipments, as some of the larger manufacturers withheld their production over the month for more favorable prices. The continued curtailment of drilling in Central West Texas fields until higher crude prices are available is being felt by natural gasoline manufacturers, as new gas production is not being made available in sufficient quantities to offset the natural depletion of production from old wells.

Tank car shipments of natural gasoline from North and Central West Texas plants amounted to approximately 16,579,710 gallons. The record for natural gasoline shipments from the state was established during the month of August, 1924, when a total of 19,754,700 gallons were moved to refiners and oil dealers in various parts of the country.

New plant construction and enlargement of old plants has been restricted to a low level since last summer, but the discovery of high gravity oil at South Vernon, Wilbarger County, will result in one plant being built by the Humble Oil & Refining Company. Humble and the Humphreys-Boyd Oil Company are starting an absorption and charcoal plant, respectively, in the new Wortham field in East Central Texas. Gas produced in the Wortham field is very lean, and shows a recovery of less than three-quarters of a gallon per thousand while the "head" is still on the field, but this yield will steadily increase as the wells settle down to pumpers. The Big Lake Oil Company has completed its natural gasoline plant in the Big Lake field, Reagan County, but is having considerable difficulty in handling the gas owing to the presence of heavy sulphur and ether contents. An abundance of rich gas will be available in the Big Lake field upon the completion of tests now drilling within the proven area, and it is reported that the Big Lake and Texon Oil & Land Companies may sell a portion of their gas production on contract.

Shipments of natural gasoline in barrels of 42 gallons, from various manufacturing centers in Texas during September, October and November follows:

Fields—	Sept.	Oct.	Nov
Eastland County	199,095	189,480	159,495
Stephens County	115,945	120,515	127,590
Burkburnett	52,295	51,705	51,550
Shackelford County	22,490	22,585	22,215
Electra	17,125	19,175	15,355
Young County	11,715	11,675	11,670
Petrolia-Clay County	4,800	4,790	4,795
Brown County	1,345	1,845	1,250
Amarillo-Potter County	590	615	835
Totals in Bbls.	425,400	422,385	394,755

Materials Bought for Corpus Christi Plant

Corpus Christi, Texas.—Materials are being purchased by the Corpus Refining Company to erect a 1,000 barrel daily capacity skimming plant at Corpus Christi, and plans are to have the plant in operation early next spring. The plant will cost approximately $75,000, and will be built to permit enlargement later on, while a unit of the Dubbs cracking process is also being contemplated. Crude will be shipped in tanks cars from the Luling and other Southwest Texas fields to supply the plant, and fuel oil contracts have been made with railroads that enter Corpus Christi.

Walter K. Campbell of Tulsa, Okla., is president of the Corpus Refining Company, and H. B. May has been elected vice president and general manager, with temporary headquarters at 1117 Frost National Bank Building, San Antonio.

Independent Refineries Taking Montana Crude

Billings, Mont.—Crude oil produced in Montana is being taken by a number of independent refineries in the state as well as by the Standard Oil Company (Indiana), the Utah Oil Refining Company and the Imperial Oil, Limited.

The Montana refineries handling Kevin-Sunburst or Cat Creek crude include the Arro Oil and Refining Company at West Lewistown, Hart Refining Company at Missoula, Lewistown Oil and Refining Company at Lewistown, Weowna Refining Company at Winnett, Sunburst Refining Company at Great Falls, International Refining Company at Sunburst and Yale Oil Corporation at Miles City.

Canadian refineries that are taking Montana crude include, besides Imperial Oil, Canadian Oil and Refining Company, Alberta Refining Company, and others.

The Waite Phillips Company of Tulsa has purchased the Beggs, Oklahoma natural gasoline plant of the Hurley Gasoline Company.

Mutual Plant in New Mexico To Be Located at Farmington

Farmington, N. M.—The Mutual Oil Company's New Mexico refinery for running crude from the Rattlesnake dome in the Navajo Indian reservation in the San Juan basin will be located here and a site already has been acquired just east of the city limits. It is hoped that the plant will be in operation by the coming summer, although no official announcement has been made concerning it.

The Mutual and the Midwest Refining Company have entered into an agreement whereby the pipe line from Rattlesnake dome will tie in with the Midwest line from the Hogback structure.

Tulsa Plant to Enlarge

Tulsa, Okla.—The capacity of the Tonkawa Petroleum Corporation plant here, which is controlled by the Constantin interests, is to be enlarged immediately. The plant has a rated capacity of 1000 barrels and it is understood that this virtually will be doubled.

Western Refiners Plan For Meeting at Kansas City

Tusa, Okla.—D. E. Buchanan, vice president of Chestnut and Smith Corporation of Tulsa has been selected as chairman of the program committee for the annual meeting of the Western Petroleum Refiners Association to be held in Kansas City, beginning Tuesday, March 3.

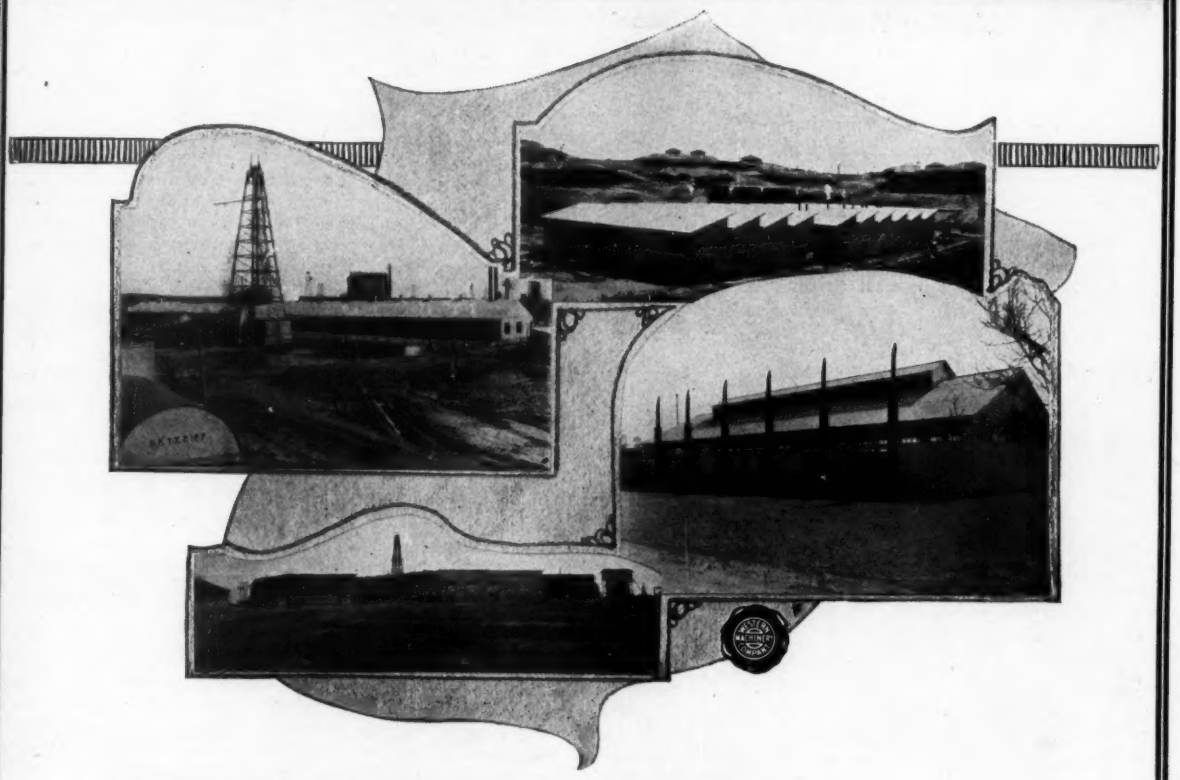
Other members of the program committee are C. L. Henderson, of Wichita, Kansas, vice president Vickers Petroleum Company; Geo. D. Locke, Barnsdall Refining Company, Chicago; P. M. Miskell, Empire Refineries, Tulsa, and D. W. Moffitt, Cosden and Company, Tulsa.

R. R. Irwin of Kansas City, vice president of the White Eagle Oil and Refining Company, has been selected as chairman of the entertainment committee for the convention. Other members of this committee are John R. Bailey of the Skelly Oil Company, E. W. Goebel of the Kansas City Refining Company, J. H. Miller of the Miller Petroleum Company and J. L. Walsh of the Mutual Oil Company.

The present outlook for the Kansas City convention is very encouraging, according to Howard Bennette of Tulsa, managing director of the Western Petroleum Refiners Association, and much interest is being evidenced in completing arrangements for the gathering.

North Texas Plant Now Repairing Fire Damages

Wichita Falls, Texas.—The Iowa Park Producing & Refining Company is repairing the damages caused to its 2500 barrels daily skimming plant when fire broke out Christmas night behind the stills and caused a loss of about $30,000. Vapor lines, towers and exchangers were badly damaged, and the plant will be out of commission until repairs can be made.



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Bakersfield, California

Arrange Gasoline Meeting Program

Tulsa, Okla.—The program committee of the Association of Natural Gasoline Manufacturers is now at work on the program for the 1925 meeting which will be held in this city during the week of April 19.

According to A. V. Bourque, secretary of the association, a questionnaire will be sent to all members asking for ideas to be discussed at the meeting which will be of most interest to the members.

Victor Gasoline Company Buys Rainbow Plant

Depew, Okla.—The Rainbow Gasoline Company natural gasoline plant near here has been sold to the Victor Gasoline Company of Tulsa for a consideration said to be $225,000.

The plant which is both absorption and compressor type, has a capacity of 18,000 gallons. Wm. Ward of Tulsa was instrumental in closing this deal.

New Oklahoma Gasoline Plant

Tulsa, Okla.—The gasoline plant of the Deer Creek Gasoline Company in the Deer Creek pool in Grant County, Oklahoma, is expected to be completed and in operation by the latter part of January or the first of February.

Deepwater Will Increase "New Process" Capacity

Houston, Texas, Jan. 17.—Due to an unusual demand for their "New Process" oils, an extensive expansion program has been mapped out for 1925 by the Deepwater Oil Refineries, Incorporated.

Construction work on three units, including six stills, condensers, receiving tanks, pumps, storage tanks and other material, will begin soon after bids, which have been advertised for, have been tabulated.

The new equipment will increase the refinery's capacity for the "New Process" oils 300 per cent.

In addition to the above work, the Deepwater contemplates erection of more agitators, wash towers and storage to take care of an increasing volume of regular pale and red oils handled.

Oklahoma and Texas Plants Buy 206 G. A. T. X. Cars

Tulsa, Okla.—According to the Mid-Continent representatives of the General American Tank Car Company, a total of 206 tank cars were sold by them in December, 1924. Messrs. R. S. Sharpe and Robert Rose, district representatives, list the sales as follows: Phillips Petroleum Company, Bartlesville, 100 insulated class four cars; Waite Phillips Company, Tulsa, 150 uninsulated class three cars and the Grayburg Oil Company, San Antonio, 56 cars.

The 206 cars are now being manufactured at the Warren, Ohio, shops of the G. A. T. X. and will be delivered late in January.

William N. Davis of Bartlesville, Oklahoma, president of the Mid-Continent Oil and Gas Association and a director of the American Petroleum Institute, has been elected a director of Phillips Petroleum Company, also of Bartlesville, succeeding F. P. Neal.

Oil Refinery Specifications Book of Interest to Engineers

"Oil Refinery Specifications," by A. L. Nugey, is among the late books for refiners. This volume is a condensed book of specifications on subjects pertaining to equipment used in refining petroleum, and is complete in its contents. It is well printed and illustrated and is replete with valuable information.

The first chapter is devoted to a general descriptive sketch of the different methods used in refining and cracking petroleum, including diagrams of each method. Then follows a chapter on "Points to be considered in the construction of oil refineries," before the specifications proper are given.

These specifications cover crude oil distilling plants; the gas absorption system; auxiliaries for crude oil distilling plants; steam distributing systems; miscellaneous piping systems; pumps; run-down tanks; oil storage tanks; cracking plants; miscellaneous tankage; agitators; steam stilling plants; loading racks; the cold settling process; the Sharples Process; the sewage system; building construction; leather belts; refrigerating machinery; wax plant equipment; walk ways; containers; painting; acid sludge recovery plant; wire rope; filling stations; general dimensions of fittings; and concrete.

In addition to these subjects the book contains data on pipe bends and calculations on fittings, with concrete proportions and dimensions of tanks.

Inasmuch as this is the first book of its kind to be published, it ought to fill an imperative need among refinery engineers and those engaged in the refinery industry.

Copies are for sale by The Gulf Publishing Company, P. O. Box 1307, Houston, Texas.

Dallas, Texas.—All purchases of refined products by the Sinclair Refining Company from refiners in the Mid-Continent and Southwest districts are being made through its buying office at Dallas since the recent closing of district offices at Tulsa. W. A. (Bill) Tracey is in charge of the Dallas office.

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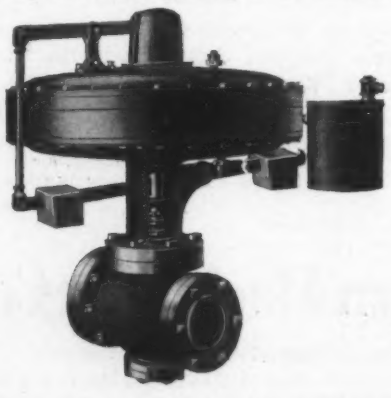
On a system discharging gases to a line, under light vacuum, it is sometimes desirable to maintain atmospheric pressure.

For this purpose, we manufacture the DUPLEX VACUUM REGULATOR, which acts as a safeguard when used on the vapor lines connected to storage tanks, for the recovery of the gases, the purpose being to prevent the pulling of a vacuum.



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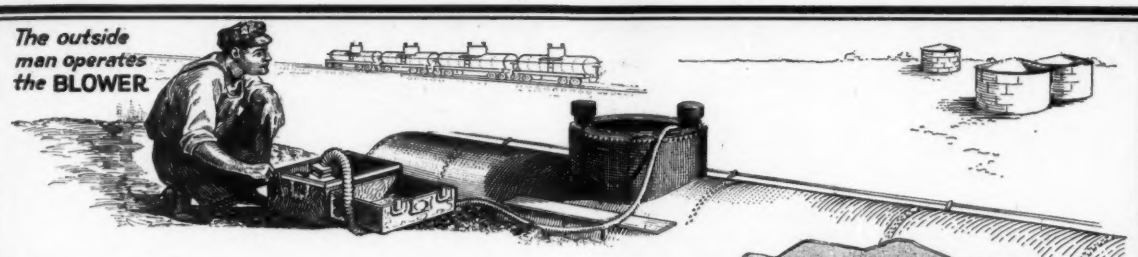

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Government Studying Possibilities of Making Carbon Black with Electricity

Washington, D. C.—The possibility of manufacturing carbon black from oils by an electrical process which possesses advantages over present methods of making this important industrial material by incomplete combustion of natural gas is indicated as the result of experiments conducted by the Department of the Interior at the Pittsburgh experiment station of the Bureau of Mines. Carbon black is a fluffy, finely divided black pigment produced by allowing the yellow flame of natural gas burning with an insufficient supply of air to impinge against a cool metal surface. Carbon black is used extensively in the making of printers' inks, as a filler in automobile tires, and in the manufacture of stove and shoe blacking, phonograph records, black leather, typewriter ribbons, carbon-copy papers, carriage cloths, oilcloths, linoleum, balck opaque photographic papers, celluloid cement, wall tints and colors, marking inks and pencils, and artificial tile.

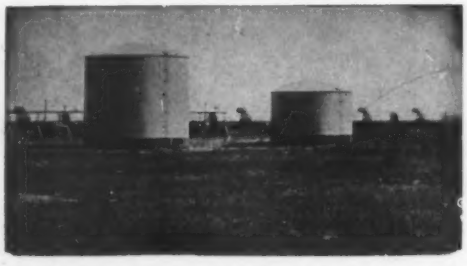
In certain States the decreasing supply of natural gas, and drastic legislation against carbon-black plants, have prevented the expansion that would be economically justified by the increasing use of carbon black in the industries and the gradual rise in price for the better grades of black. At present, Louisiana is the center of carbon-black production in the United States, and the black has to be shipped comparatively long distances to the chief markets, at freight rates that are high because of the bulkiness of the black.

In the course of investigations of the effects of high voltage electrical discharges on hydro-carbons, it was noted by the Bureau of Mines chemists that, under certain conditions, natural gas could be decomposed and carbon black produced. The effects of several types of electrical discharge on natural gas and on liquid hydrocarbons and other oils was therefore studied by J. J. Jakosky, associate engineer, in order to ascertain the fundamental factors in the reactions. In the study of natural gas, the possible influence of these factors on the recovery of a larger part of the carbon content of the gas than is now possible was investigated.

In the manufacture of carbon black from oils, by the arc process developed by the Bureau of Mines, the two main essentials are a cheap electric power and cheap light-oil distillates. The process is suitable for non-continuous or intermittent operation and could, therefore, utilize some of the cheap off-peak power available in practically all parts of the United States and in many foreign countries. Because of the abundance of cheap off-peak power in nearly al large industrial centers, carbon black in many places can be manufactured where it is needed, with a considerable saving in freight rates alone. Especially will this be true as to certain eastern states and as to foreign markets. Prices for second-class power differ considerably with local conditions, but enough off-peak power is available in well-scattered regions of this country at prices ranging from 0.01 cent to 0.05 cent per kilowatt hour. Power in many foreign countries is considerably cheaper.

In connection with the electrical manufacture of carbon black by the Bureau of Mines process, it is probable that the unsaturated gases produced during the decomposition of the oil may constitute profitable by-products if utilized for the manufacture of alcohols. Non-condensable gases formed in connection with the process are suitable for domestic fuel and could probably be sold in those localities where a market exists for domestic gas, thus reducing the total net cost of producing carbon black.

About 20 to 25 per cent of the present output of carbon black in the United States is used in printing and the allied industries. The rapid growth of the automotive industry has created



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And, they are heavy plate, tight riveted, tight caulked—and guaranteed gas-tight.

Let us quote you on your requirements. Estimates promptly furnished without obligation.

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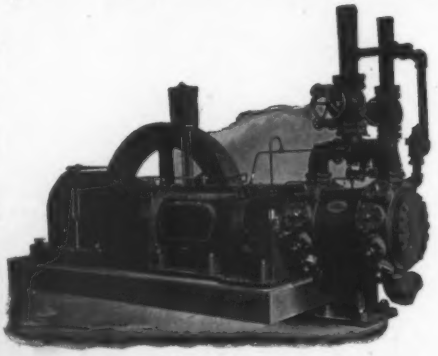
Vilter Ammonia Compressors Fittings and Pipe Coils Render Years of Reliable Service



Compressors built in several types and a great variety of sizes. Illustration is of a high speed type compressor.

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When you crack Gas Oil and degrade a good portion into Fuel Oil you do so at a loss

Either way you face the old skimming plant problem of the gasoline carrying the whole burden and when the gasoline produced is only 30% of the original charge it is not enough to carry the load

When you crack Fuel Oil and produce only gasoline, stove distillate and Gas Oil, all of greater value than the Fuel Oil charging stock, you have a profit on all products made

This is only possible by the non-residuum runs using Fuel Oil as charging stock and non-residuum runs are only possible with the Dubbs Process

You can also make non-residuum runs with the Dubbs Process using Gas Oil as charging stock if you wish, but the lower the cost of the charging stock the larger your profit on the gasoline produced

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an extensive market for carbon black as a toughener in rubber. Addition of carbon black as a reinforcing agent has given greater elasticity and tensile strength to the rubber of rubber tires, and is said to have increased tire mileage 20 to 30 per cent. Approximately 30 to 35 per cent of the total output of carbon black in the United States is used in the rubber industry in the manufacture of automobile tires, hard rubber, electrical insulation, radio and auxiliary high-frequency and high-voltage equipment, and so forth.

About 15 to 25 per cent of the carbon black made in the United States is exported for use in the same industries as in this country. Large quantities go to England, France, and Germany for rubber compounding and to Japan and China for manufacture into "India" and other inks, paints and enamels.

Details of these experiments are described in Technical Paper 351, by J. J. Jakosky, copies of which may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a price of 10 cents.

Mutual Plans Enlargements Along With Change of Name

Denver, Colo.—In connection with the proposal to change the company's corporate name to that of the Continental Oil Company, the Mutual Oil Company has in contemplation an extensive expansion program.

Work has begun on enlarging the company's refinery at Glenrock, Wyoming, that will entail an expenditure of around $250,000 and will include the building of an absorption plant, construction of a new boiler house, installation of a fire fighting system and reconditioning some of the present stills.

The company also contemplates the erection in the near future of a modern office building in Denver, the cost of which will run up into the million. While nothing official has been forthcoming, it is understood that the structure may be as high as 12 stories and will be modern in every respect.

The Continental Oil Company now occupies a six-story building that the company purchased some years ago but with the consolidation of the two companies that will not be adequate for the merged forces.

Geo. G. Oberfell Goes With Phillips Petroleum Company

Tulsa, Okla.—George G. Oberfell, in charge of the research work of the Hope Engineering and Supply Company, has resigned to take charge of the research department of the Phillips Petroleum Company, at Bartlesville, Oklahoma.

In obtaining the services of Mr. Oberfell, the Phillips Petroleum Company has found one of the most able and successful gasoline experts and his engineering ability has brought him international renown.

The engineering experiences of Mr. Oberfell dates back from 1912 when he became affiliated with the U. S. Bureau of Mines at Pittsburgh. After three years with the bureau, he became associated with the Ohio Fuel Supply Company at Columbus; resigning from this connection he was with the chemical warfare department at Washington for the full duration of the world war. In 1920 Mr. Oberfell came to Tulsa with the Chestnut and Smith Corporation and remained with that organization until 1923 at which time he joined W. L. Seely in consulting work at Breckenridge, Texas. During the time of this affiliation, he designed and superintended the construction of the Landreth Gasoline plant which has recently been sold to the Phillips Petroleum Company. In this plant Mr. Oberfell installed his invention of the charcoal process for greater recovery of gasoline, a process now used by practically every manufacturer of natural gasoline.

Mr. Oberfell has recently written and published a book entitled "Natural Gasoline" which is considered one of the best ever published.

Louisiana Concern Adds Two More Cracking Units

Shreveport, La.—The Louisiana Oil & Refining Company is reported to have placed orders in December for the erection of a two unit cracking plant to be added to its refinery at Bossier City, near Shreveport, and will probably start construction work in the latter part of January.

A gasoline recovery plant is also being erected at this refinery to take off the rich gasses form stills and tanks. It will have facilities to handle about 1,250,000 cubic feet of gasses daily, and a yield of eight or nine gallons of gasoline per thousand cubic feet of gas is expected.

Fort Worth, Texas.—Fred E. Hosmer, superintendent of gasoline plants for the Gulf Production Company, has transferred his headquarters and office force from Shreveport to Fort Worth, and is now located on the ninth floor of the W. T. Waggoner building in the latter ctiy.

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Refiner's Supplies

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Soda Ash light 58%.....cwt.	$1.38
Silicate of Soda 60 deg. bbls. .....cwt.	1.70
Sal Soda wks .....cwt.	1.10–1.25
Caustic Soda 76% .....cwt.	3.10
Chloride of Lime solid .....cwt.	1.90–2.10
Sulphuric Acid 60 deg.tank cars f.o.b. shipping point per ton	9.00–10.00

Benzol—

90% tank cars	.23	
Pure tank cars	.24	.25

Jobbers' Supplies

Vegetable Oils—

*Linseed, carloads, spot....gal.	$1.15	
Less carload, spot.....gal.	1.18	
5 bbls. or less, spot.....gal.	1.21	
Boiled, tank, spot.....gal.	1.11	
Boiled, carloads, spot.....gal.	1.17	
Soya Bean, spot, tank.....lb.	.12	

Animal Oils—

English Degras .....lb.	.04⅝
Domestic Degras bbls. carloads . . ..lb.	.04¼
Horse .....lb.	.09½

Oleic Acids—

Dist. . .....lb.	.11½
Saponified .....lb.	.11½

Lard Oils—

Prime	
Winter	
Strained .....1 to 1½ ffa. 40/45c. t. lb.	.19⅞
Extra	
Winter	
Strained .....2 to 4½ ffa. 40/45c. t. lb.	.18
Extra....4 to 5 ffa. 40/45c. t. lb.	.16¼
Extra No. 1 .....7 to 10 ffa. 40/50c. t. lb.	.14¾
Extra No. 1 .....15 to 18 ffa. 40/50c. t. lb.	.14¼
No. 2..22 to 23 ffa. 40/45c. t. lb.	.13¾
Prime Edible Tallow under 1⅞ ffa. 40/45c. t. N. Y.....lb.	12½
Tallow acidless .....lb.	.13¾
Lard Stearine .....lb.	.19
Oleo Stearine .....lb.	.11¾

Neatsfoot Oil—

Pure .....bbls.-lb.	.15¾
Extra .....bbls.-lb.	.14¾
No. 1 .....bbls.-lb.	.14¼
Cold Pressed .....lb.	.18½

Fish Oils—

Menhaden Oil

Light pressed .....gal.	.70–.72
White . . ..gal.	–.75
Yellow bleached . .....gal.	–.73
*Herring, tankcars coast....gal.	–.40
Whale, ext. winter bleached gal.	–.80
Seal	Nominal

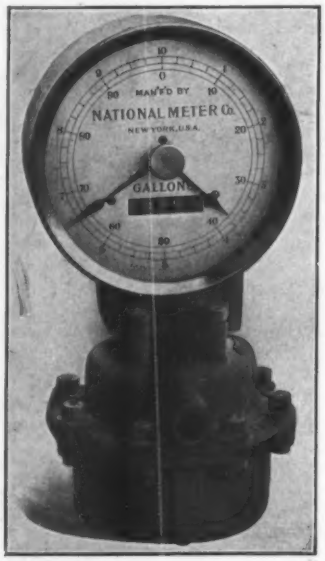
Naval Stores—

Turpentine, N. Y. .....gal.	.93	
†Turpentine .....gal.	.87½	
Rosin B., N. Y.....bbl.	8.20	
Rosin F., N. Y. .....bbl.	8.20	
Rosin B.† .....bbl.	7.00	
Rosin F.† .....bbl.	7.00	
Rosin Oil 1st run.....gal.	.45	
Rosin Oil 2d run.....gal.	.47	

Pine Tar—

Kiln Burnt .....bbl.	12.00
Retort . .....bbl.	11.50

*Nominal.
†Savannah, Ga., market.



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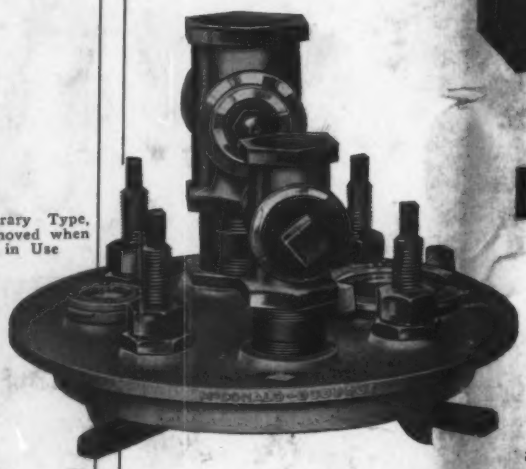
Permanent Type is Protected by Cast Steel Top While in Transit



Temporary Type, is Removed when not in Use

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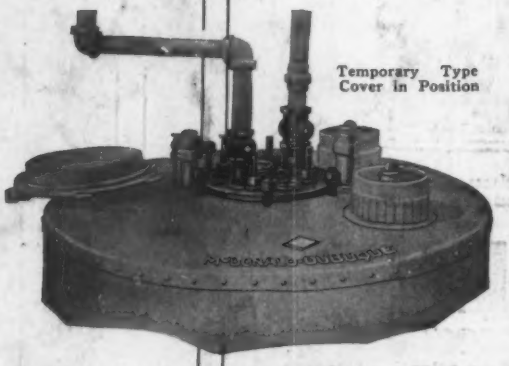
Stopped By This Cover

It is hard to believe that the Industry has actually been losing as much gasoline as it has, through non-gas-tight loading and unloading.

One refiner saved $125,000 in 16 months by changing to gas-tight loading. Another stopped losses as high as 10 per cent on hot days. Another stopped evaporation losses of 4 to 5 hundred gallons per car.

"What shocking and needless waste," would be the comment of many older industries. But fortunately a halt is being called. Soon there will be no more non-gas-tight loading or unloading of gasoline.

The McDONALD Universal Gastite Dome Cover (patent pending), a most highly perfected product, deserves your investigation. Ask for full particulars.



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